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International Baccalaureate®
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ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 2

Wednesday 6 May 2009 (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. (a) Define the terms *sustainability* and *carrying capacity*.

(i) Sustainability: *[1]*

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(ii) Carrying capacity: *[1]*

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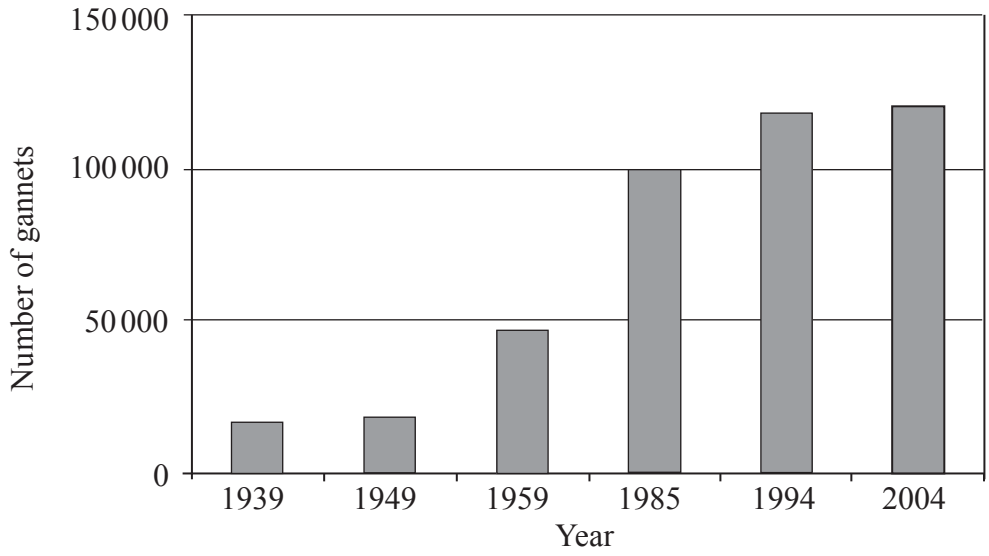
The northern gannet is a large, colonial-nesting seabird that nests mainly on remote islands in the North Atlantic.

[Photo: Gannet Birds Under Threat from Global Warming. © University of Leeds. Reprinted with permission]

The bar graph below shows the number of northern gannets in the breeding season over various years on the island of St Kilda, off the west coast of Scotland.



[Source: Adapted from www.nts-seabirds.org.uk/properties/st_kilda, © The National Trust for Scotland]

(This question continues on the following page)

(Question 1 continued)

(b) Identify **three** different phases in the growth of this population and suggest an explanation for each phase. *[6]*

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(Question 1 continued)

(c) On a nearby island, for many decades local people killed about 2000 gannets a year for food, but the size of the gannet population hardly changed. Suggest why the gannet population was able to remain almost constant. *[1]*

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2. A small glacier receives an input of 20 units of ice in the form of snowfall each year. As the ice melts, 19 units are lost through run-off, and 2 units through evaporation.

(a) Draw a labelled flow diagram showing these processes and their relationships. *[3]*

(b) State what would happen to the glacier if these inputs and outputs were to remain constant for several years. *[1]*

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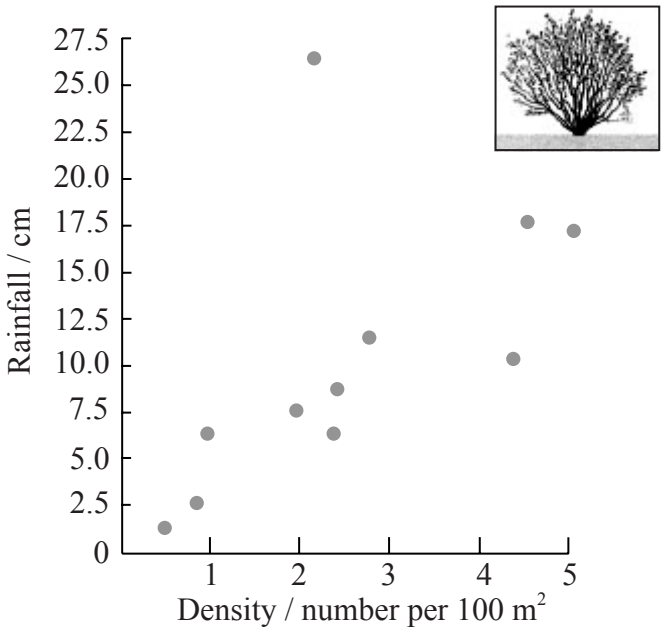
3. The graph below shows the density of creosote bushes (*Larrea tridentata*) plotted against rainfall in the Mojave Desert in California.



[Source: adapted from G MacDonald, *Biogeography*, John Wiley and Sons, 2003]

Describe **and** explain the trend shown in the graph. *[4]*

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4. (a) Define the term *soil*. *[2]*

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(b) Outline the **three** stages in soil formation. *[3]*

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(c) State **one** example of an **abiotic** process taking place within the soil system that involves transfer and **one** that involves transformation.

(i) Transfer process: *[1]*

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(ii) Transformation process: *[1]*

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5. (a) Name **and** briefly describe an ecosystem that you have studied. *[1]*

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(b) Name **three** abiotic factors that are important in this ecosystem. *[1]*

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(c) For **one** of these abiotic factors explain how it may affect the abundance of a **named** organism that is found in the ecosystem. *[2]*

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(d) Explain how a **named** biotic factor other than human activity might affect the abundance of the organism named in 5(c). *[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) With reference to an ecosystem you have studied explain the difference between succession and zonation. *[6]*

(b) Describe how the biodiversity, biomass and productivity change as an ecosystem undergoes succession. *[7]*

(c) Describe, with examples, the characteristics of organisms that might be found in the early and late stages in a succession. *[4]*

Expression of ideas [3]

7. (a) Describe how the ozone in the upper atmosphere may have been depleted. *[7]*

(b) Describe the possible consequences of the depletion of ozone. *[4]*

(c) Compare ozone depletion and global warming in terms of the challenges and successes of strategies that have been used to reduce the effects of these problems. *[6]*

Expression of ideas [3]

8. (a) Describe how energy is transferred within the inner Earth, in the atmosphere and in the oceans. *[11]*

(b) Describe the way in which the distribution of solar energy input at the Earth's surface influences the distribution of biomes. *[6]*

Expression of ideas [3]