N09/4/ENVSY/SP2/ENG/TZ0/XX

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**ENVIRONMENTAL SYSTEMS**
**STANDARD LEVEL**
**PAPER 2**

Tuesday 10 November 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.



0108

## SECTION A

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

**1.** (a) Define the term *ecosystem*. *[2]*

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(b) "In the sea we meet with a million of herrings for a single shark." (William Paley, 1802)

Explain why in a marine ecosystem there might be many fewer sharks than smaller fish such as herrings. *[2]*

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(c) The graph below shows the numbers of rabbits and hares shot in an area of farmland in eastern England between 1949 and 1967. (Rabbits and hares are ground-living herbivorous mammals.)


*(This question continues on the following page)*

*(Question 1(c) continued)*

(i) Using the graph, describe the changes in the number of **rabbits** killed between 1949 and 1967. *[3]*

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(ii) Explain the changes in the number of rabbits and hares killed, and the relationship between these two. *[4]*

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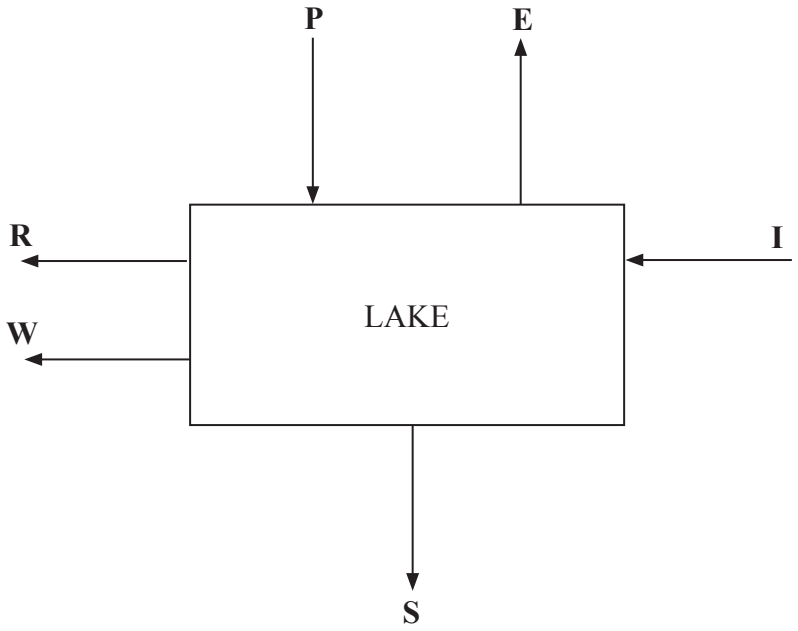
**2.** The flow diagram below shows the flows of water into and out of a lake.




| Symbol | Description | Volume / $10^6$ $m^3$ $yr^{-1}$ |
|---|---|---|
| R | Run-off leaving the lake in a stream | 10 |
| W | Water removed by pipeline for irrigating crops | 5 |
| P | Precipitation falling on lake | 6 |
| E | Evaporation from lake to atmosphere | 4 |
| I | Inflow from surrounding land in streams | 14 |

(a) (i) State whether this is an example of an open, closed or isolated system. *[1]*

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(ii) Give a reason for your answer. *[1]*

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(iii) Calculate the value of **S**, the seepage from the lake into the rocks beneath, assuming the system illustrated above is in equilibrium. *[1]*

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*(This question continues on the following page)*

*(Question 2 continued)*

(b) State whether the freshwater in this system is an example of renewable, replenishable, or non-renewable natural capital, giving a reason for your answer. *[2]*

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(c) Suggest what would happen to the sustainability of the system, if the amount of water taken for irrigation were to increase by 10 million cubic metres per year, and there were no other changes in the system. *[2]*

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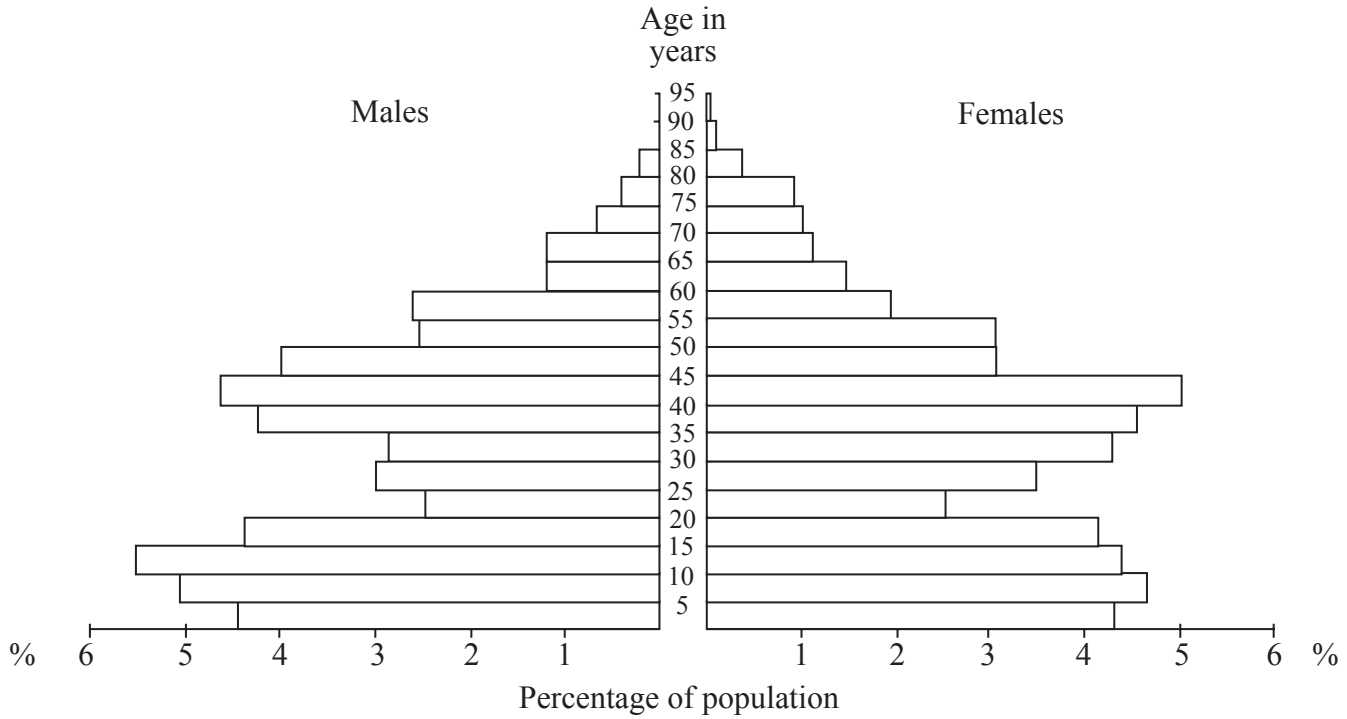
**3.** The diagram shows the age-sex pyramid for an area of Spain in 1960.




(a) Describe and explain the shape of this pyramid. *[5]*

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(b) State **two** reasons why it is difficult to estimate the carrying capacity of an area for its human population. *[2]*

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**4.** (a) Draw any typical soil profile and annotate your sketch. *[3]*

(b) Name **two** types of transformation that might occur in this soil. *[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.*

**5.** (a) Describe, with the help of a diagram, the tricellular model of the Earth's atmospheric circulation. *[9]*

(b) Explain why deserts occur at the latitudes of about 30 degrees North and South. *[3]*

(c) Discuss the reasons for the low productivity of desert biomes. *[5]*

*Expression of ideas [3]*

**6.** (a) Distinguish the concept of *succession* from that of *zonation*. *[3]*

(b) Outline what is meant by the term *climax community* and state some of the abiotic factors that affect the nature of a climax community. *[5]*

(c) Compare the reproductive strategies of organisms in pioneer and climax communities, with the help of sketches of survivorship curves. *[9]*

*Expression of ideas [3]*

**7.** (a) With the help of a diagram, describe the circulation of carbon. On your diagram label at least **four** storages and **three** processes. *[7]*

(b) Describe how the circulation of carbon is linked to the **energy budget** of the Earth. *[6]*

(c) Discuss how human activities influence the rate at which carbon circulates. *[4]*

*Expression of ideas [3]*