N08/4/ENVSY/SP3/ENG/TZ0/XX

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ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 3

Tuesday 18 November 2008 (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 letter of the Option answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.

0116

Option A — Analysing Ecosystems

The compulsory question below relates to the detailed study of ecosystems.

A1. (a) (i) Distinguish between percentage frequency and percentage cover when sampling organisms with a quadrat. *[2]*

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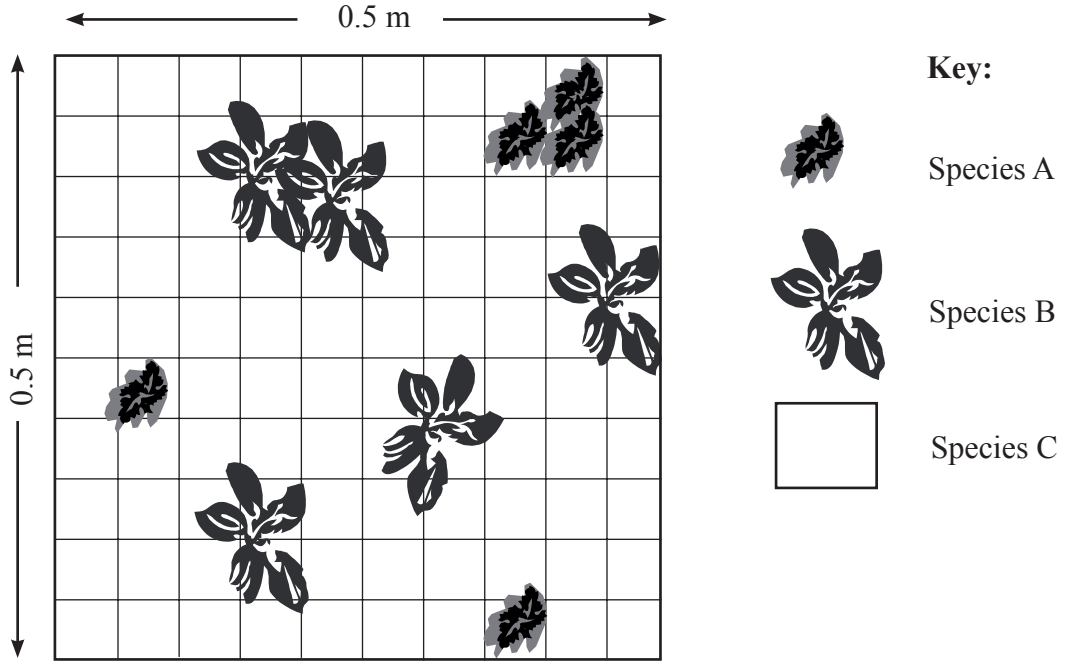
Quadrats like the one shown below were used to sample the vegetation on a playing field.



(ii) State the percentage of the total quadrat area represented by each small square. *[1]*

. . . . . .

(iii) Estimate the percentage cover of species A, B and C shown in the quadrat above. *[4]*

Species A: . . . . . .

Species B: . . . . . .

Species C: . . . . . .

(This question continues on the following page)

(Question A1(a) continued)

(iv) Estimate the population density per square metre for species B. *[2]*

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Small brown snails were found living beneath the leaves of species A and B. Students collected all the snails they could find on the field. They marked the shells of the snails with non-toxic orange paint and scattered them evenly back over the field. The following week as many snails as possible were collected and counted again and the number with orange marks in this second sample was also recorded.

(b) (i) Use the data in the table below to estimate the snail population of the playing field. Show your workings. *[2]*

Week 1	**Week 2**	
Number of snails found and marked	**Number of snails found**	**Number of snails found with marks**
84	40	12

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(ii) Evaluate the methods used to mark the snails and to return them to the field. *[3]*

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(This question continues on the following page)

(Question A1(b) continued)

(iii) State, giving a reason, whether the estimate of the snail population is likely to be too high **or** too low in this particular investigation. *[1]*

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Some of the snails of the same species from another area were kept in the laboratory for two weeks. Their enclosure was cleaned and they were fed fresh food daily.

(c) (i) List the **five** measurements you would need to make to calculate the gross and net productivity of the snails (assuming that you used conversion tables to convert any biomass measurements to energy). *[3]*

1. . . . . .

2. . . . . .

3. . . . . .

4. . . . . .

5. . . . . .

(ii) Complete the word equations that could be used to calculate gross and net productivity for the snail population from the measurements listed above. *[2]*

Gross secondary productivity = ...

. . . . . .

Net secondary productivity = ...

. . . . . .

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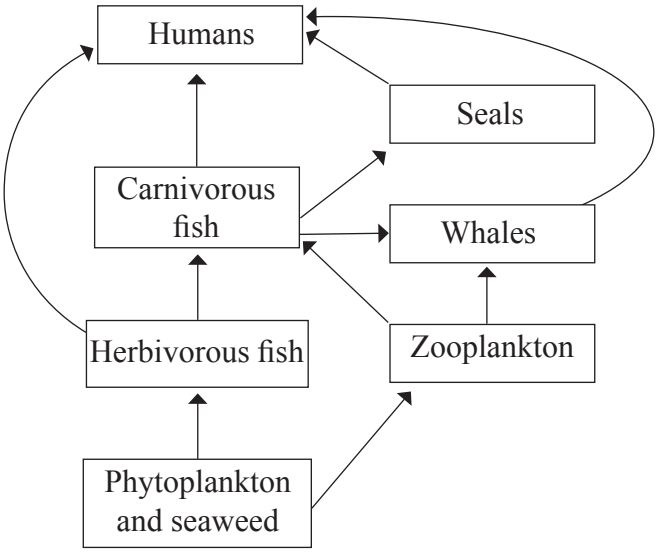
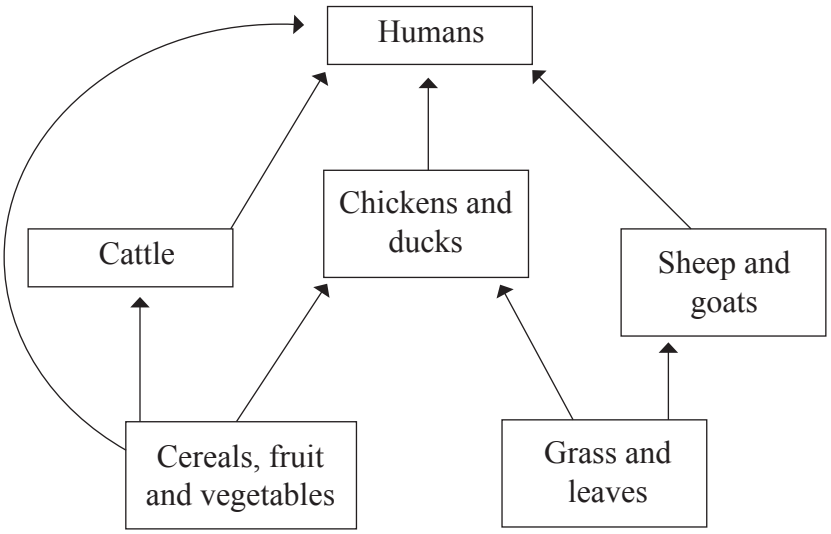
Option B — Impacts of Resource Exploitation

B1. The diagrams show two simplified food webs exploited by humans: one aquatic and one terrestrial.

Aquatic



Terrestrial



(This question continues on the following page)

(Question B1 continued)

(a) (i) Using only the information given in each of the food webs shown on the previous page, state which trophic levels humans exploit for food. *[2]*

Aquatic food web: . . . . . .

. . . . . .

Terrestrial food web: . . . . . .

. . . . . .

(ii) Suggest which **two** trophic levels from aquatic ecosystems provide the most food for the world's population. *[1]*

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(iii) Outline **two** reasons why terrestrial systems are more important as a food source for humans than aquatic systems. *[2]*

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(iv) Describe **two** differences **and two** similarities in the way humans exploit terrestrial **and** aquatic systems for food. *[4]*

Differences: . . . . . .

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Similarities: . . . . . .

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(This question continues on the following page)

(Question B1(a) continued)

(v) As world population increases, more food will be needed. Explain why increasing the use of fertilizers and irrigation to increase yields may not be sustainable. *[2]*

Fertilizers: . . . . . .

. . . . . .

Irrigation: . . . . . .

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The table shows some ecological footprint data for a developing country A and a developed country B.

	***Per capita* footprint / ha**	**National footprint / $\times 10^6$ ha**	**Area of country / $\times 10^6$ ha**
Developing country A	1.2	61.2	58.3
Developed country B	8.6	25.8	2.0

(b) (i) Explain how it is possible for country A to have a smaller *per capita* footprint but a larger national footprint than country B. *[2]*

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(ii) Use the data in the table to explain why the lifestyle of the population of country B is likely to be unsustainable in the long term. *[2]*

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(This question continues on the following page)

(Question B1 continued)

(c) Country B has a temperate climate and generates electricity by burning fossil fuels. The government of country B wants to reduce the country's ecological footprint.

Outline both the advantages and disadvantages of changing to large scale hydroelectric power and nuclear power to generate electricity in country B. *[5]*

Nuclear power:

Advantages . . . . . .

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Disadvantages . . . . . .

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Large scale hydroelectric power:

Advantages . . . . . .

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Disadvantages . . . . . .

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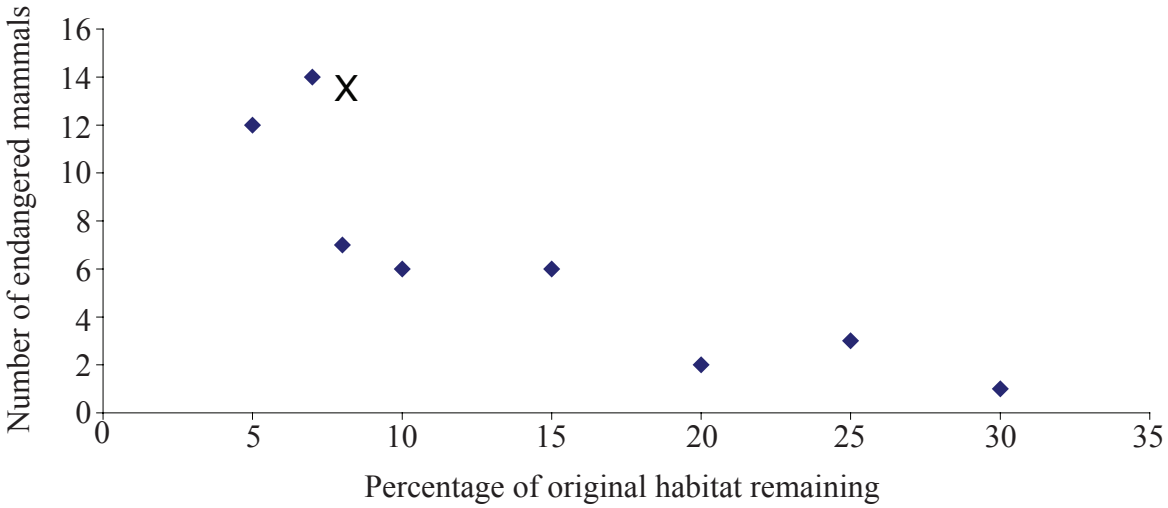
Option C — Conservation and Biodiversity

C1. The graph below shows how the number of endangered mammal species varies with the percentage of their original habitat remaining, in a number of conservation areas from around the world.



[Source: adapted from www.biodiversityhotspots.org/xp/Hotspots/hotspotsScience/conservation]

(a) (i) Describe **and** explain the trend shown in the graph. *[2]*

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(ii) The number of endangered species at point X on the graph is particularly high, possibly because of habitat fragmentation. Outline what is meant by habitat fragmentation **and** why it may reduce biodiversity. *[3]*

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(This question continues on the following page)

(Question C1 continued)

(b) (i) State the difference between an endangered species and a vulnerable species, giving a **named** example of each, both from the **same** region or ecosystem. *[3]*

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Endangered species: . . . . . .

Vulnerable species: . . . . . .

(ii) Using an example, explain how the degree of specialization of a species can make it more likely become extinct. *[2]*

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(iii) Describe **and** evaluate the effectiveness of captive breeding and reintroduction programmes in reducing the risk of a vulnerable or endangered species becoming extinct. Give an example. *[4]*

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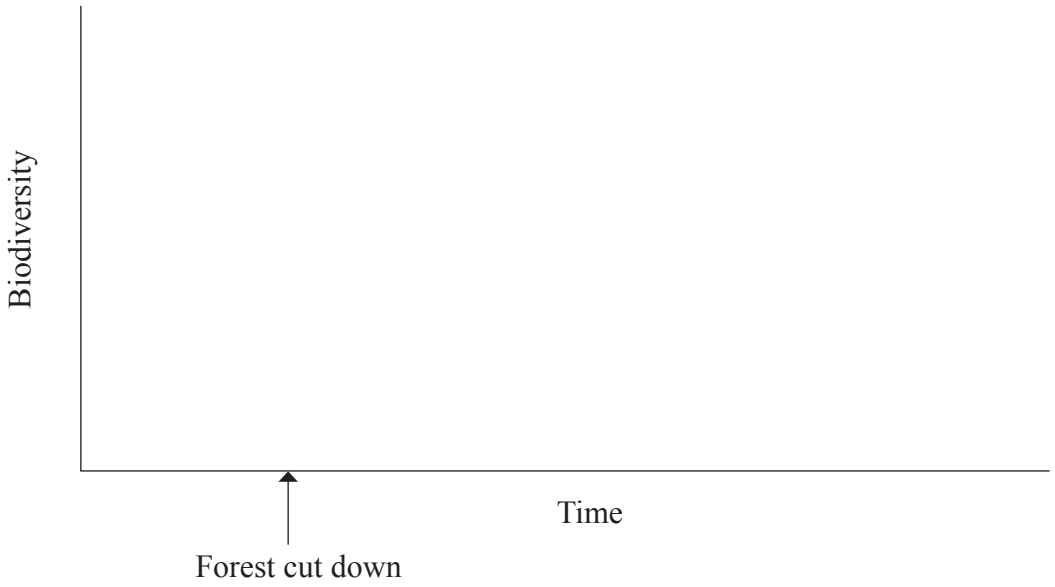
(Question C1 continued)

(c) Sketch a line graph to show how biodiversity changes as an ancient tropical rainforest is logged and converted to farmland and then is subsequently reinvaded by forest. *[4]*



(d) Describe **one** way in which the Convention on International Trade in Endangered Species (CITES) may help to reduce the threat to an endangered species, **and one** difficulty with implementing the convention. *[2]*

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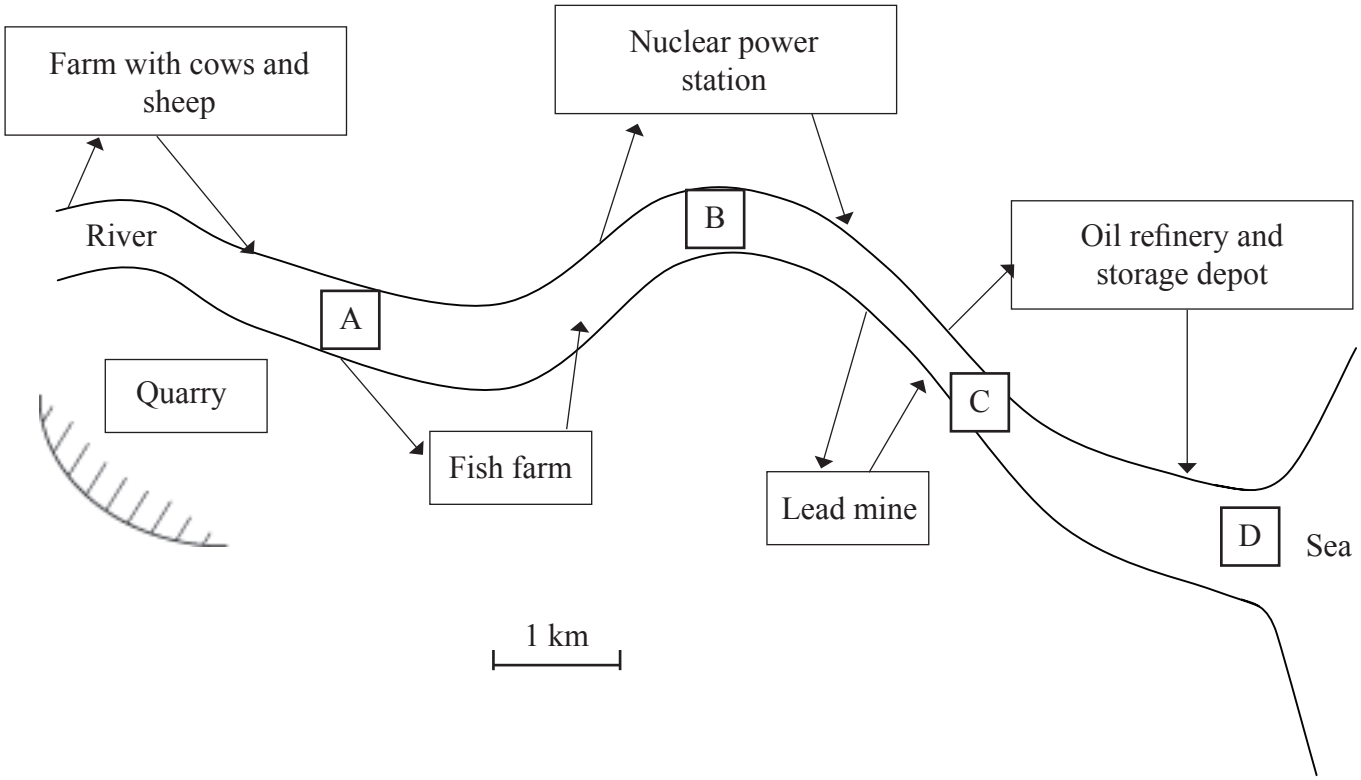
Option D — Pollution Management

D1. The sketch map below shows a river running through farmland and industrial areas before reaching the sea. The arrows represent the outputs of water and inputs of pollutants from human activities taking place close to the river.



(a) (i) Define *BOD*. *[1]*

. . . . . .

(ii) Identify **one** point on the river (A, B, C or D) where BOD is likely to be high, giving a reason for your choice. *[2]*

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(This question continues on the following page)

(Question D1 continued)

(b) (i) State an industrial source of pollution such as a lead mine, a nuclear power station **or** an oil refinery.

Industrial pollution source: . . . . . .

For the industrial source named above, describe **two** types of pollution commonly produced. *[2]*

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(ii) State, with a reason, whether the industrial source named above is a point **or** non-point source. *[2]*

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(c) (i) Describe how **one** of the types of pollution you have listed in (b) (i) above could be reduced at the point of emission at this site. *[1]*

Type of pollution: . . . . . .

Method of reducing pollution before emission: . . . . . .

. . . . . .

(ii) Describe how **one** type of pollution you have listed in (b) (i) above could be cleaned up after it had been released into the environment. *[1]*

Type of pollution: . . . . . .

Method of cleaning up pollution after emission: . . . . . .

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(This question continues on the following page)

(Question D1 continued)

(d) Evaluate the likely effectiveness of the methods described in (c) (i) and (ii) in reducing pollution. *[4]*

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(Question D1 continued)

(e) It is proposed to use an abandoned quarry close to the river as a landfill site for domestic waste (see diagram on page 13).

(i) Suggest **two** environmental problems that may occur if the quarry were to be used for disposal of domestic waste. *[2]*

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(ii) Describe **one** advantage **and one** disadvantage of using composting to dispose of domestic organic waste. *[2]*

Advantage: . . . . . .

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Disadvantage: . . . . . .

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(iii) List **three** other types of domestic waste that should be recycled or reused, rather than disposed of in landfill.
For each type, explain whether the waste needs recycling or if it can be used without further processing. Give examples of how each type of waste can be reused, with or without recycling or other processes. *[3]*

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