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Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use

General Certificate of Education
June 2008
Advanced Level Examination

ENVIRONMENTAL SCIENCE
Unit 4 Biotic Resource Management

ESC4



Friday 20 June 2008 1.30 pm to 3.00 pm

You will need no other materials. You may use a calculator.

Time allowed: 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English, clear presentation and appropriate use of specialist vocabulary. Question 6 should be answered in continuous prose. Quality of Written Communication will be assessed in this answer.
- This unit assesses your understanding of the relationship between the different aspects of Environmental Science.

For Examiner's Use			
Question	Mark	Question	Mark
1		5	
2		6	
3			
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			



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ANSWER IN THE SPACES PROVIDED**



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

- 1 Indicate with a tick (✓) whether the statements are true or false.

Statement	True	False
Fishing can be made more sustainable by setting quotas below the maximum sustainable yield		
The most efficient fish farms have energy ratios greater than 1		
Transgenics is simply a faster version of selective breeding		
Boycotting furniture made from tropical hardwoods may result in faster disease cures		
Organic farming systems are less productive than intensive systems because no pest control is allowed		

(5 marks)

5

Turn over for the next question

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- 2 (a) Outline the characteristics of intensive farming.

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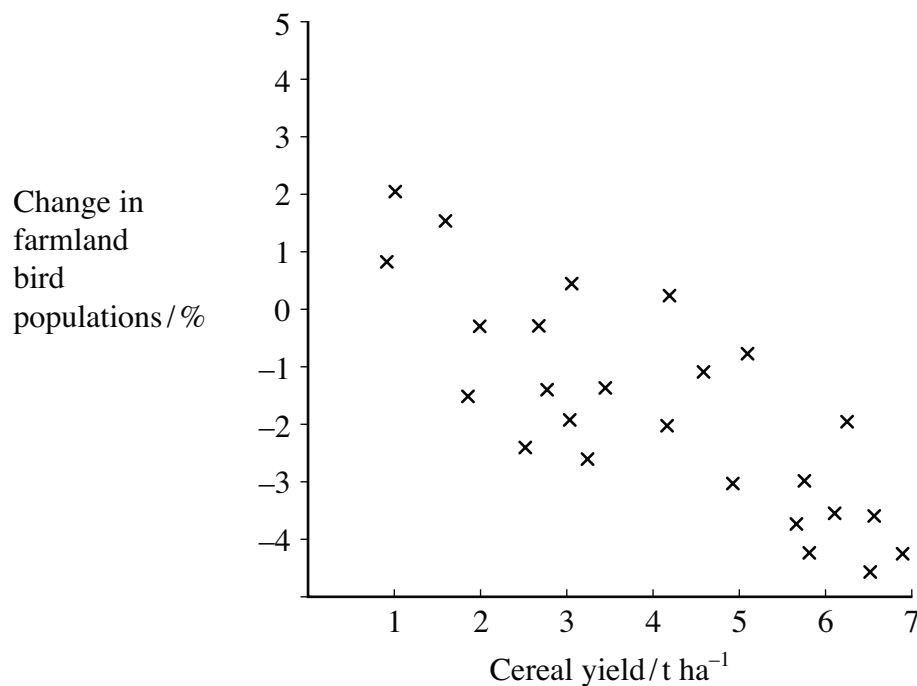
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(2 marks)

- 2 (b) The graph shows the relationship between cereal yield and changes in the farmland bird populations in European countries.



- 2 (b) (i) Describe the trend.

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(1 mark)



- 2 (b) (ii) Suggest explanations for the trend.

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(2 marks)

- 2 (c) As part of the UK and European agri-environment scheme, organic farmers are entitled to claim additional payments because it is recognised that this particular farming system benefits the environment.

Explain how organic farming benefits the environment.

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(5 marks)

10

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3 Figures 1, 2 and 3 provide data on world fertiliser consumption.

Figure 1

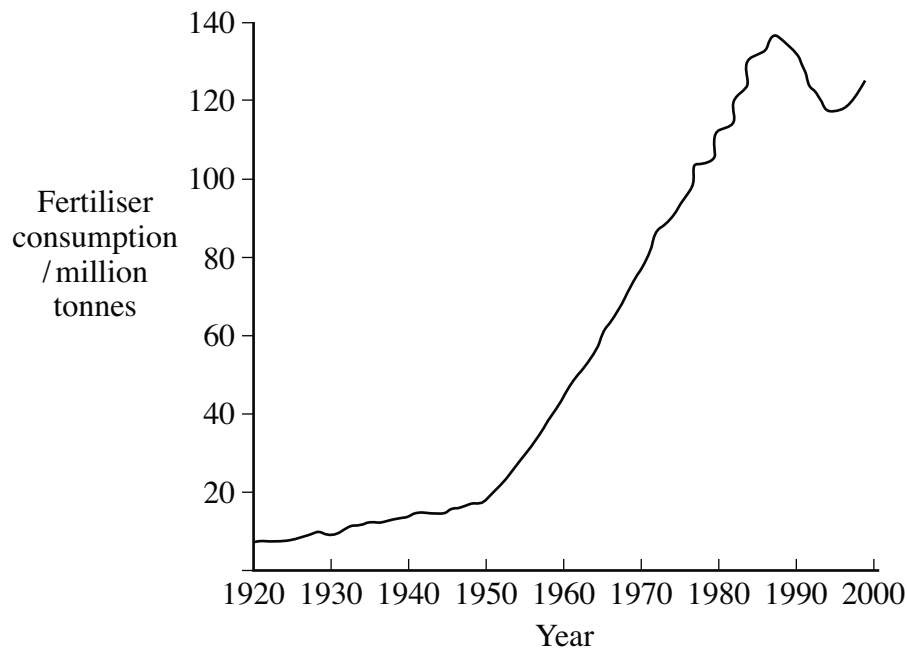


Figure 2

Changes in the proportion of different fertilisers used / %

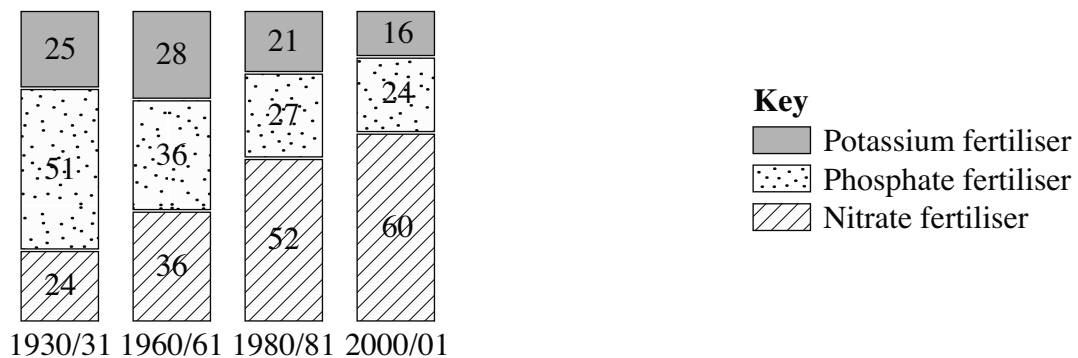
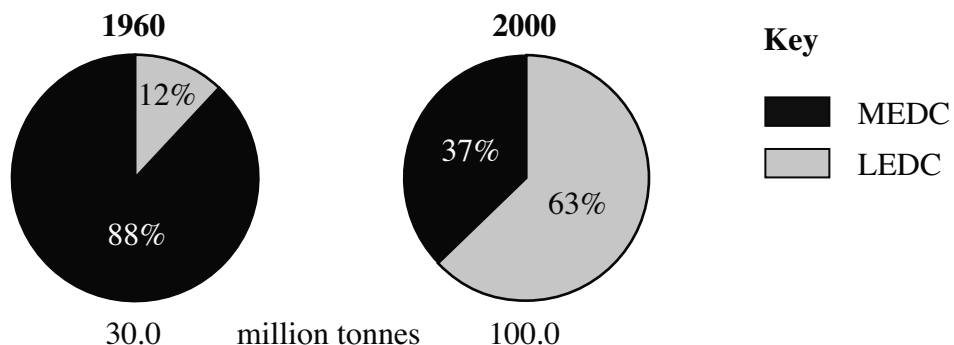


Figure 3

Regional share of world fertiliser consumption / %



3 (a) Summarise the trends.

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(3 marks)

3 (b) Explain why farmers need to apply fertilisers annually to land that is used for growing cereals.

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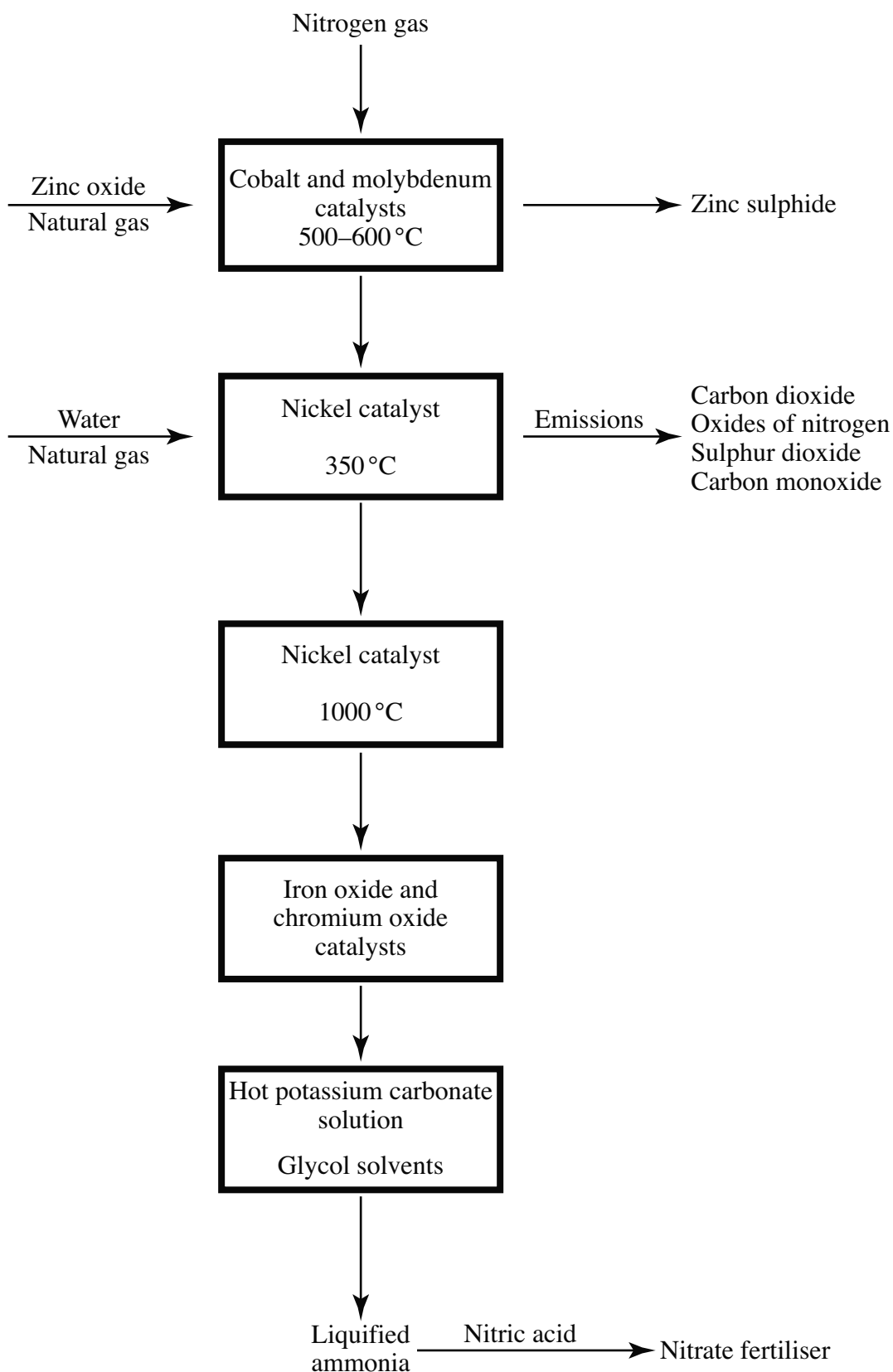
(2 marks)

Question 3 continues on the next page

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- 3 (c) The manufacture of nitrate fertilisers uses nitrogen gas to produce ammonia. The diagram shows some of the processes involved.



Comment on the sustainability of this production method.

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(2 marks)

- 3 (d) In Europe over the last decade, cereal yields have increased but fertiliser consumption has decreased. Suggest **three** ways by which this has been achieved.

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(3 marks)

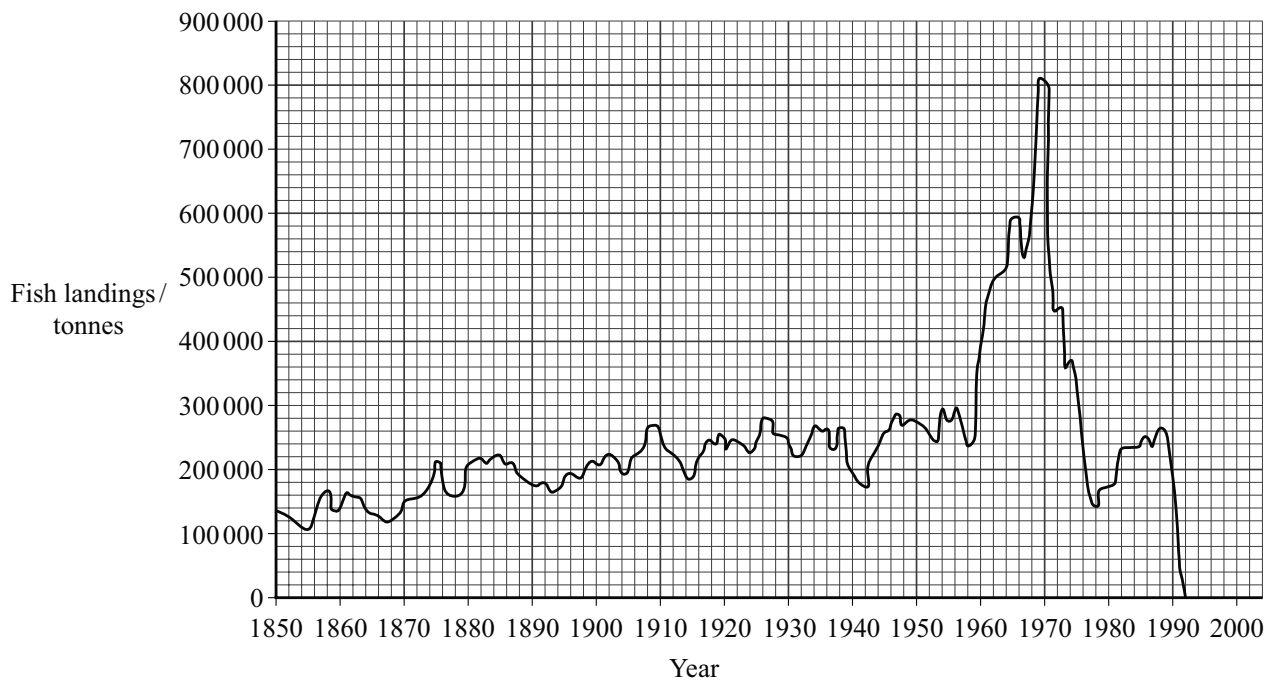
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- 4 The graph shows the change in cod catch off the coast of Newfoundland. For hundreds of years, the fishery was exploited only by small, locally-based boats. In the late 1950s, large commercial trawlers from several countries began exploiting the deepest parts of this fishery. Quotas were introduced in the early 1970s and commercial fishing was banned in June 1992. Limited fishing was reintroduced in 1998, but the catch continued to decline and the fishery was closed permanently in 2003.



- 4 (a) Summarise the data shown.

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(3 marks)



- 4 (b) Outline why large commercial trawlers had such a damaging effect on the fishery.

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(2 marks)

- 4 (c) Suggest why quotas often fail to conserve fish stocks.

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(2 marks)

- 4 (d) What information is needed in order to estimate the maximum sustainable yield of a fishery?

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(3 marks)

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5 Read the article and then answer the questions that follow.

Saving the rainforests: Who should pay?

1

Forest destruction leads to local floods and landslides. Imagine that the cleaning up operation costs \$20 million. This means that it could have been worth paying the government of the country \$20 million to conserve the forest. The only people who suffer from the floods and landslides are locals; does this mean that they should have to pay the \$20 million?

5

No, because tropical forest destruction also leads to global climate change, which affects people all over the planet.

Forests have other broad functions.

1 Watershed protection

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30 % of the world's largest cities depend on forests for their water. Industries downstream of the forest, hydroelectric plants, irrigation systems and municipal water systems all benefit from the forest. In Costa Rica, landowners in critical watershed areas are paid \$30 per hectare by these industries to maintain the forest.

2 Biodiversity protection

15

Landowners are paid to conserve habitats and species of insects and birds that are crucial for agriculture. They are also paid to develop ecotourism and eco-labelled products such as shade-grown coffee and herbal medicines.

3 Carbon absorption

In an effort to encourage forest conservation and creation, the Kyoto Protocol offers countries \$10 per tonne of carbon absorbed. This aspect of the Protocol is expected to raise \$300 million per year for afforestation and reforestation.

20

However, the poor countries of the tropics argue that, whilst they are doing the hard work, it is the whole planet that is getting the benefit. If, for example, Malaysia protects its forests, maintains biodiversity and reduces global climate change, it will lose a fortune in income from timber sales. Many far richer countries, regions, cities and individuals will benefit. So who should pay Malaysia for its efforts?

25



5 (a) Explain:

5 (a) (i) how forest destruction can cause flooding and landslides (line 2)

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(4 marks)

5 (a) (ii) the statement that '30 % of the world's largest cities depend on forests for their water' (line 11)

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(3 marks)

5 (a) (iii) why conservation of insects and birds is considered crucial (line 16).

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(2 marks)

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- 5 (b) Calculate the mass of carbon that tropical forests are expected to capture annually in this aspect of the Kyoto Protocol (lines 20–22).

Answer
(1 mark)

- 5 (c) Suggest a scientific basis for each of the following scenarios.

- 5 (c) (i) The UK Government could pay Malaysia for helping to protect the UK coastline.

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(3 marks)

- 5 (c) (ii) The US Department for Agriculture could pay Malaysia for plant genetic material.

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(2 marks)



- EITHER**

- OR**

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(20 marks)

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