

Surname					Other Names				
Centre Number					Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Education
SPECIMEN UNIT
 Advanced Level Examination

ENVIRONMENTAL STUDIES
Unit 4 Biological Resources and Sustainability

ENVS4



Date and Time

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

For Examiner's Use			
Number	Mark	Number	Mark
1		5	
2		6	
3		7	
4			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			

Time allowed: 2 hours

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 80.
- 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 7 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 the relationship between the different aspects of Environmental Science.

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

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

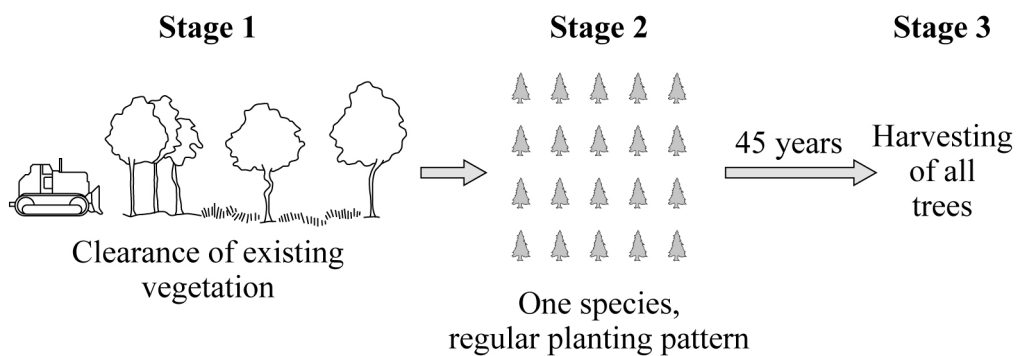
1 Complete the table.

Term	Definition
Monoculture	
Fishing catch quota	
Energy ratio of agricultural systems	
Integrated pest control	
Maximum Sustainable Yield	

(5 marks)

5

2 The diagram shows stages in the development of a pine tree plantation in Australia.



2 (a) Outline the advantages to the producer of growing trees in plantations.

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(2 marks)

2 (b) Suggest the likely impact of the tree removal shown in **Stage 3** on:

2 (b) (i) forest hydrology

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(3 marks)

2 (b) (ii) soil stability.

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(2 marks)

Question 2 continues on the next page

- 2 (c) Economists conducted a cost benefit analysis to evaluate the desirability of a proposed shrimp farm development in mangrove forests in the coastal wetlands of Cambodia. The tables show the expected costs and benefits of the development up to the end of year 1 and up to the end of year 5.

Year 1

Total Costs and benefits from start of project to the end of year 1 ('000 US \$)					
	Shrimp production	Loss of fuelwood and construction timber	Loss of coastline protection	Habitat loss	Total
Costs	-	321	195	123	639
Benefits	1370	-	-	-	1370

Year 5

Total Costs and benefits from start of project to the end of year 5 ('000 US \$)					
	Shrimp production	Loss of fuelwood and construction timber	Loss of coastline protection	Habitat loss	Total
Costs	-	2110	4900	5015	12025
Benefits	4190	-	-	-	4190

With reference to the data, explain what the cost benefit analysis suggests about the economic viability of the shrimp farm proposal.

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(3 marks)

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3 (a) Explain why soil may be considered a finite resource.

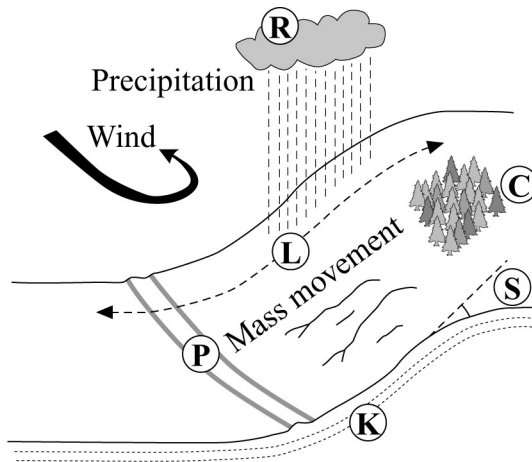
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(1 mark)

3 (b) The Universal Soil Loss Equation (USLE) is used to predict the amount of erosion that will take place in an area whose land use is changed.

A = R × K × L × S × C × P
where

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|---|
| A = the predicted soil loss |
| R = the climatic erosivity or the rainfall erosivity index |
| K = soil erodibility |
| L = slope length |
| S = slope gradient |
| C = cover and management |
| P = erosion control practice |



Give **two** features of a soil that will affect its erodibility.

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(1 mark)

3 (c) Describe the ways in which farmers control slope gradient to reduce soil erosion.

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(3 marks)

3 (d) Suggest how different methods of increasing soil nutrient levels may affect the likelihood of soil erosion occurring.

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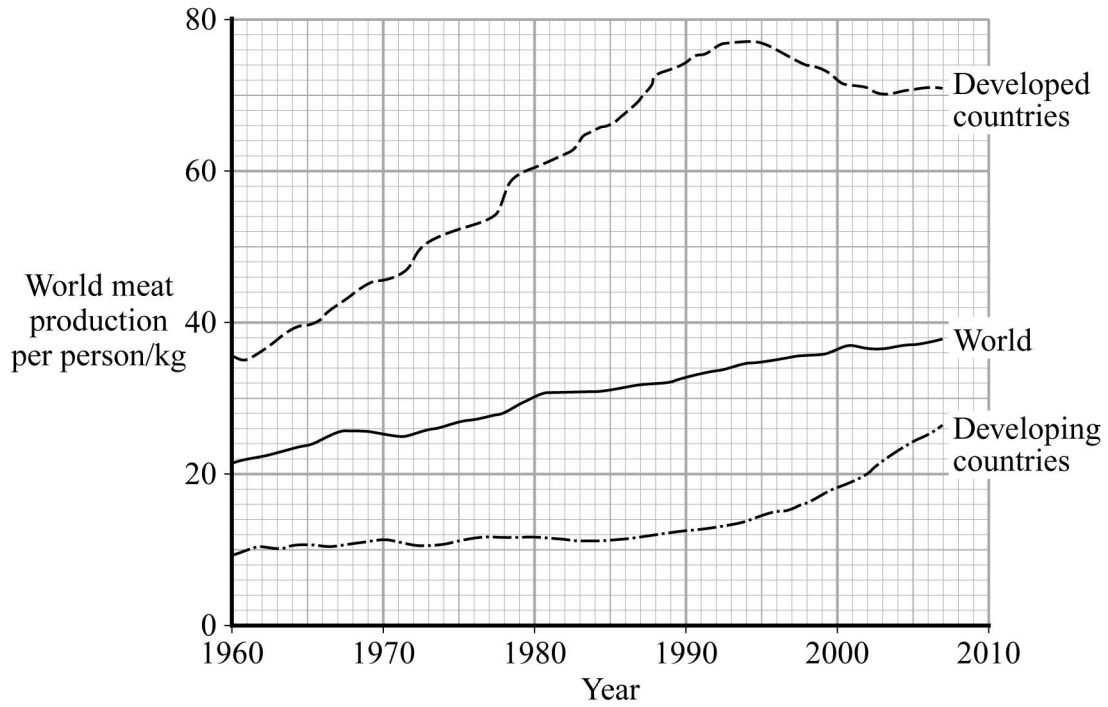
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(5 marks)

10

Turn over for the next question

4 The graph shows changes in per capita world meat production between 1960 and 2007. The table summarises some of the characteristics and impacts of intensive meat production.



4 (a) Explain the difference between intensive and extensive livestock production methods.

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(3 marks)

- 4 (b) Discuss the sustainability of feeding the world's growing population by increasing meat production.

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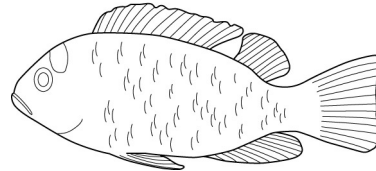
(7 marks)

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Turn over for the next question

- 5 (a) An investigation was conducted in Africa to evaluate the effect of using different types of organic manure on the abundance of plant plankton and on the growth and survival of Tilapia (*Oreochromis niloticus*) which eat the plankton. Tilapia is a freshwater fish that is an increasingly important source of protein for villagers.

Tilapia



- Twelve 20 m² ponds were stocked with young Tilapia.
- The fish growth was monitored over the following year.
- Three types of organic manure were used regularly: chicken manure, cattle manure and pig manure.
- The composition of each manure type was analysed.

- 5 (a) The experiment was planned with great care to ensure that a fair test was carried out, eg identical stocking densities were used.

Suggest **four** other ways in which the experimental method could have been standardised to ensure a fair test.

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(2 marks)

5 (b) **Table 1** and **Table 2** show some results from the investigation.

Table 1

Manure type	Composition of manure/dry mass %			
	Nitrogen	Phosphorous	Potassium	Organic matter
Chicken	1.4	0.8	0.6	46.2
Cattle	0.6	0.3	0.6	20.6
Pig	1.4	0.6	0.5	20.1

Table 2

Manure	Mean mass of Tilapia/g			
	Week 0	Week 20	Week 8	Week 60
Chicken	18	170	320	505
Cattle	18	153	275	430
Pig	18	150	278	420

5 (b) (i) Use the information in **Table 1** to suggest an explanation for the different growth rates in **Table 2**.

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(1 mark)

5 (b) (ii) The scientists concluded that the difference in growth rates produced by the different manures was significant at the 99% level. Explain the meaning of *significant at the 99% level*.

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(1 mark)

5 (b) (iii) Adding too much manure could kill the fish by causing deoxygenation. Outline why Biological Oxygen Demand (BOD) is used to assess the severity of organic matter pollution rather than measuring the mass of organic matter present.

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(1 mark)

5 (c) The low fish stock density of open ponds can be increased by using floating cages in shallow lakes, but the harmful effects of this method of fish farming on the surrounding lake can be serious.

Aquaculture	Maximum stock density/kgm ⁻³
Open ponds	5
Cages in lake	10

Describe a practical procedure that could be used to assess how far from the floating cage fish farm biodiversity may be affected.

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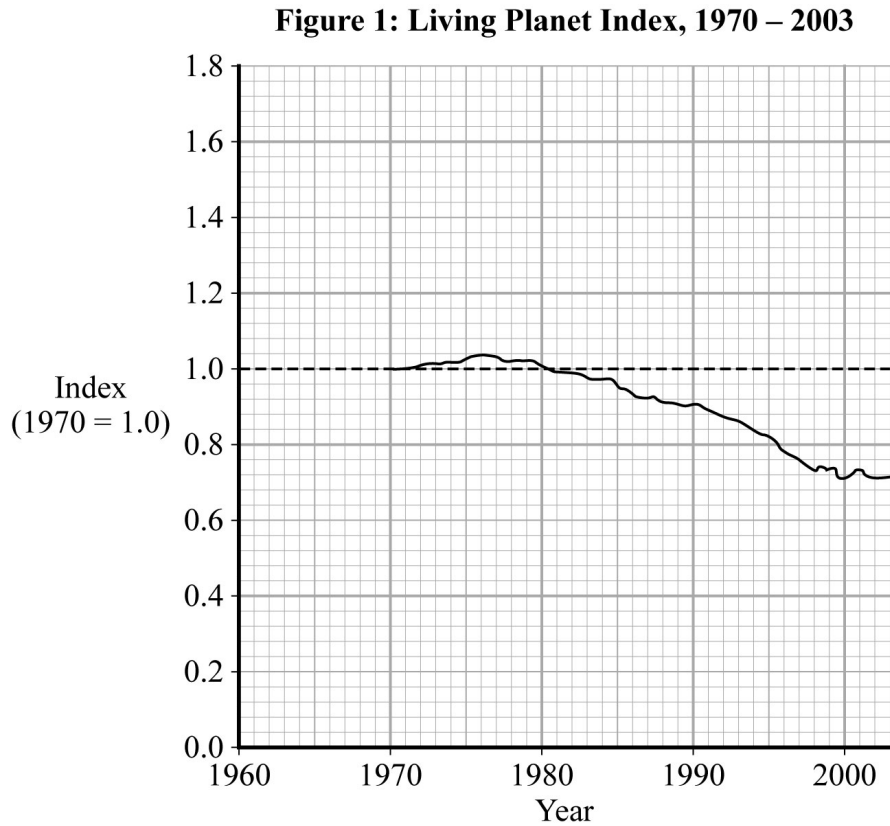
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(5 marks)

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- 6 (a) **Figure 1** shows the Living Planet Index developed by WWF. It shows the change in the total population of terrestrial, marine and freshwater plant species from 1970.



Source: Figures 1, 2 and 3 adapted from, *Living Planet Report 2006*, World Wide Fund for Nature (WWF)

Explain why the survival of the human population relies on maintaining biodiversity.

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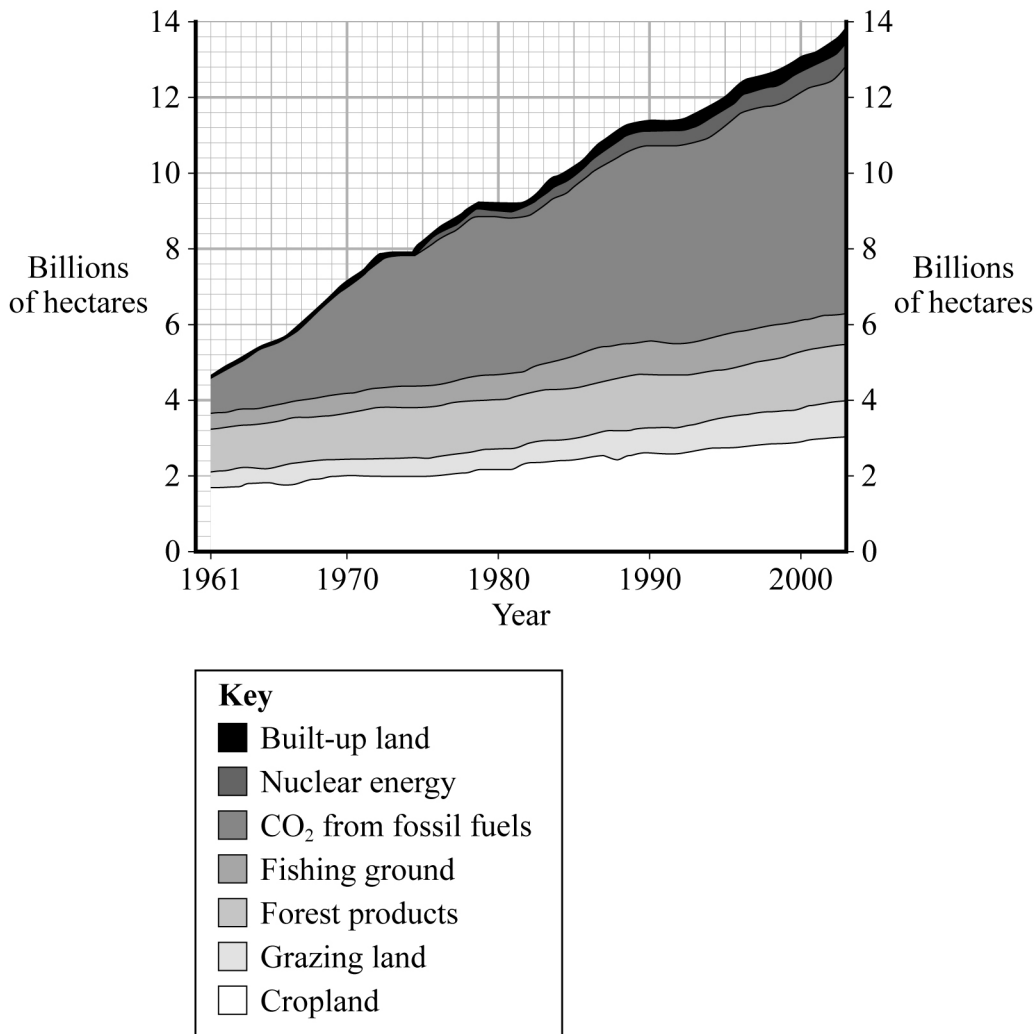
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(3 marks)

- 6 (b) A country's Ecological Footprint is a measure of the area of the Earth needed to provide its food, fibre, timber and housing and to absorb the carbon dioxide (CO₂) released by its burning of fossil fuels. The size of each footprint depends on the size of the country's population and per capita resource consumption.

Figure 2 shows how the components of the human global ecological footprint have changed since 1961.

Figure 2: Ecological Footprint by Component, 1961 – 2003



Source: Figures 1, 2 and 3 adapted from, *Living Planet Report 2006*, World Wide Fund for Nature (WWF)

- 6 (b) (i) With reference to **Figure 2**, summarise the major changes shown that have occurred between 1961 and 2003.

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(2 marks)

6 (b) (ii) Suggest how governments could use the information in **Figure 2** to plan how to reduce their countries' footprints most effectively.

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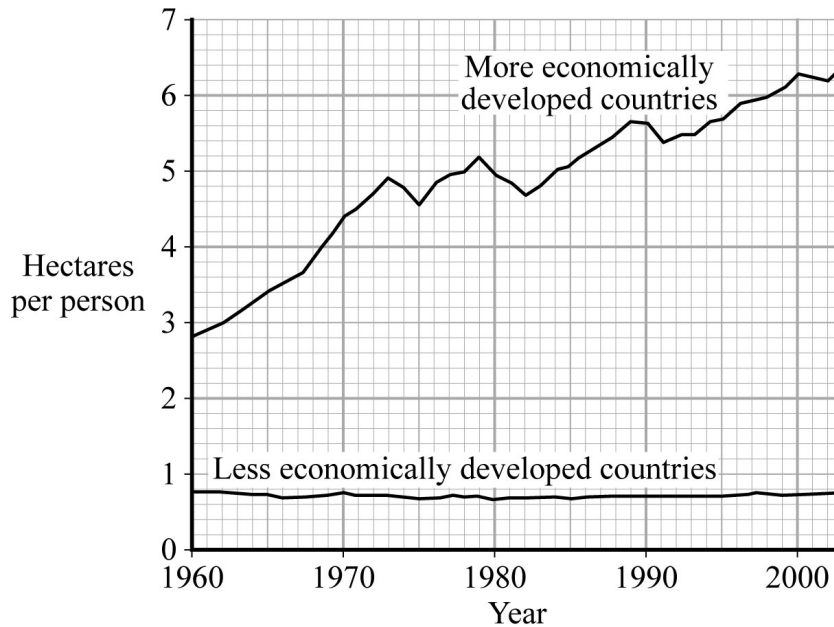
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(5 marks)

Question 6 continues on the next page

- 6 (c) **Figure 3** shows changes in the ecological footprint of countries according to their level of development.

Figure 3: Footprint by National Average Per Person Income, 1960 – 2003



Source: Figures 1, 2 and 3 adapted from, *Living Planet Report 2006*, World Wide Fund (WWF)

Figure 4 shows the average population growth rates for countries at different stages of economic development.

Figure 4

	Annual population growth rate / %
More economically developed countries	0.2
Less economically developed countries	1.2

Use the information in **Figures 1, 2, 3, 4** and your own knowledge to discuss the impact on the global footprint of the population in LEDCs reaching the level of affluence found in MEDCs.

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(5 marks)

15

Turn over for the next question

7 Write an essay on **one** of the following topics. Credit will be given for your understanding of the relationship between different areas of the subject and also for the organisation and presentation of the essay and use of grammar, punctuation and spelling.

EITHER 7 (a) Discuss the ways in which forests provide support systems for life on Earth. *(20 marks)*

OR 7 (b) Discuss the advantages and disadvantages of the methods that can be used to control agricultural pests. *(20 marks)*

OR 7 (c) Discuss ways in which the marine environment could be managed more sustainably. *(20 marks)*

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