

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2004



**ENVIRONMENTAL SCIENCE
HIGHER TIER
Written Paper**

3441/H

H

Wednesday 23 June 2004 1.30 pm to 3.30 pm

In addition to this paper you will require:
a ruler.
You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		6	
2		7	
3		8	
4		9	
5		10	
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: 2 hours

Instructions

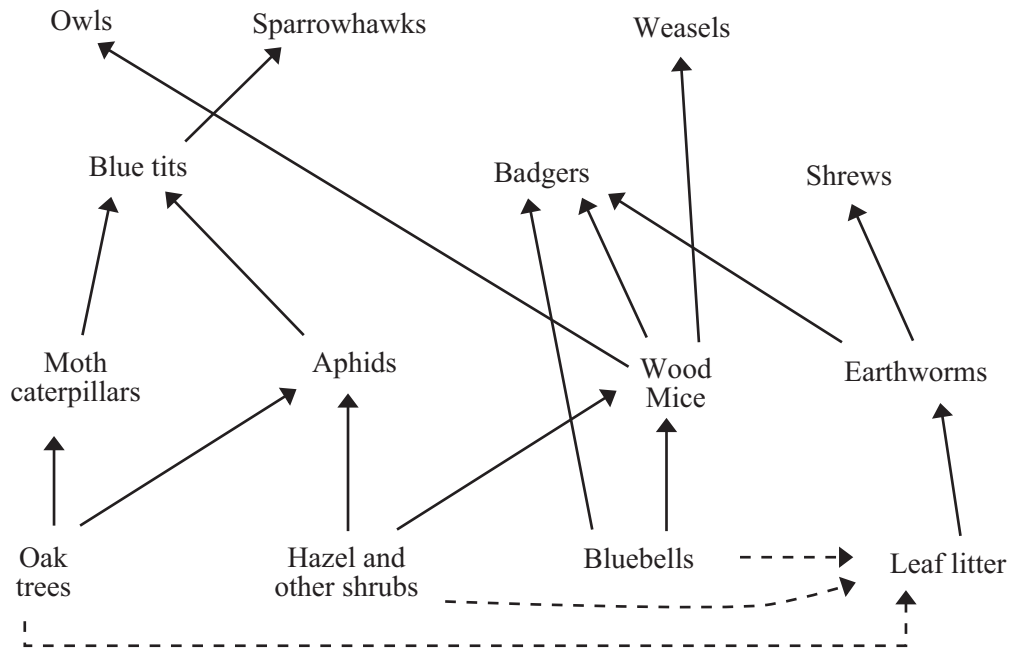
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this paper is 120.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

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

- 1 (a) The diagram shows the food web for an area of woodland.



- (i) What is the original source of energy for this food web?

.....
(1 mark)

- (ii) Using the diagram, name **two** organisms which feed on Wood Mice.

1.....

2.....

(1 mark)

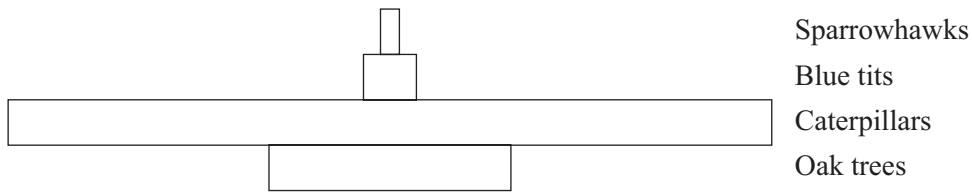
- (iii) State **two** effects which would be likely to happen if sparrowhawks stopped feeding in this area of woodland.

1.....

2.....

(2 marks)

- (b) The diagram, which is not drawn to scale, shows a pyramid of numbers for one food chain in the area.



- (i) In the space below, sketch a pyramid of biomass for this food chain.

(3 marks)

- (ii) A survey found 542 wood mice in this area, but only 4 weasels and 2 owls. Explain why there were far more mice than weasels and owls.

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(3 marks)

10

Turn over ►

- 2 (a) The table shows the percentage by volume of some of the gases in the Earth's atmosphere.

Gas	% by volume
	78
	21
	0.035

- (i) Complete the table by writing the correct names of the gases in the empty spaces.
(3 marks)
- (ii) State **two** reasons why oxygen is important to life on Earth.
- 1.....
- 2.....
(2 marks)
- (b) Many scientists believe that millions of years ago the sun gave out less heat than it does now, but that the temperature on Earth was similar to its present day value.
- (i) Tick the box next to the statement about carbon dioxide concentrations in the Earth's atmosphere which best fits in with this idea.
- There was less carbon dioxide in the Earth's atmosphere millions of years ago than there is now.
- There was more carbon dioxide in the Earth's atmosphere millions of years ago than there is now.
- There was the same amount of carbon dioxide in the Earth's atmosphere as there is now.
(1 mark)
- (ii) Explain your choice in part (b)(i).

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(2 marks)

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

3 The photograph shows a disused cement works and a quarry for the raw material used to make the cement.



Source: MARTIN SNOW, [www.adur.org.uk/images/cement works 3/index.htm](http://www.adur.org.uk/images/cement%20works%203/index.htm)

(a) (i) Name the rock used to make cement.

.....
(1 mark)

(ii) State **two** other uses for this rock.

1.....
2.....
(2 marks)

(b) (i) The cement works and quarry shown in the photograph have closed down. Some local people were happy when this happened, but others wanted the industry to carry on.

Explain why different people might have had such different opinions.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(5 marks)

(ii) State **one** possible use for the disused quarry and cement works site and state **one** action which would be needed to reclaim the site in the way you have suggested.

Use.....

.....

Action required

.....

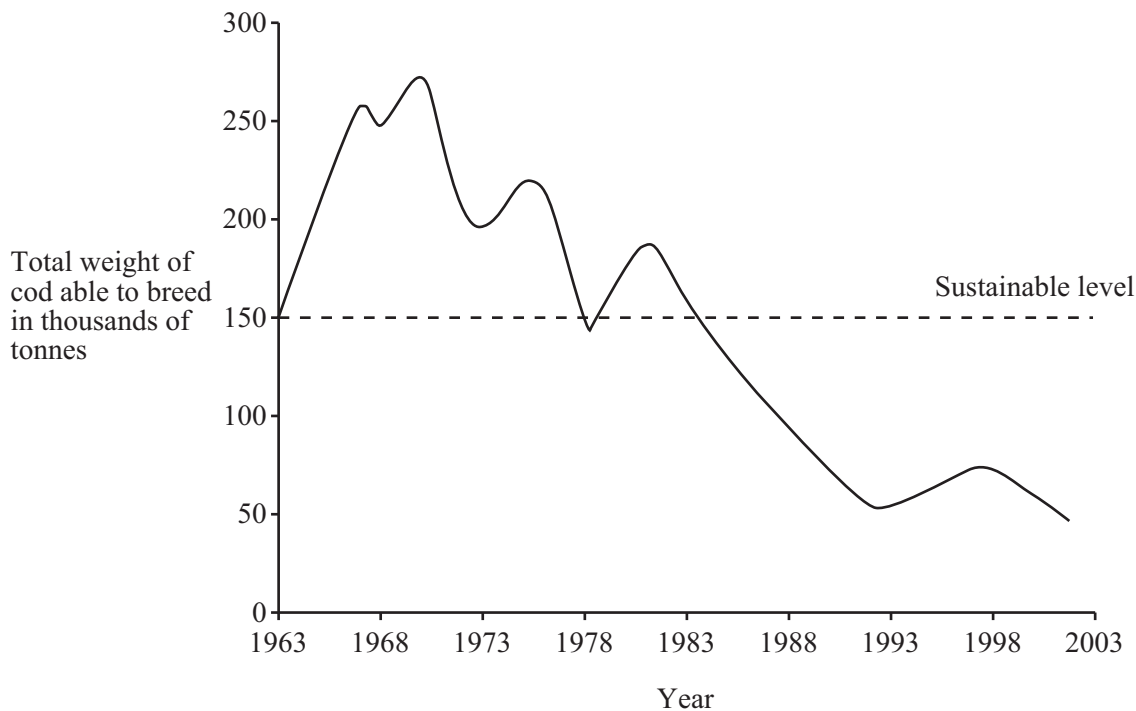
(2 marks)

$\frac{\quad}{10}$

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 4 (a) The cod is a fish which is caught from the sea and used as food. The graph shows the changes which have taken place in the amount of cod in the North Sea since 1963.



- (i) Describe the pattern of change shown by the graph.

.....

.....

.....

(2 marks)

- (ii) The International Council for the Exploration of the Seas (ICES) gives scientific advice on the conservation of stocks of sea fish. In October 2002 ICES said that the fishing industry should stop catching cod in the North Sea.

Using evidence from the graph, explain why they said this.

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(4 marks)

(b) (i) Suggest **one** reason why fishermen were against a ban on cod fishing in the North Sea.

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(1 mark)

(ii) A change in the equipment used for commercial fishing can help to conserve stocks of fish.

State and explain **one** way that this can be done.

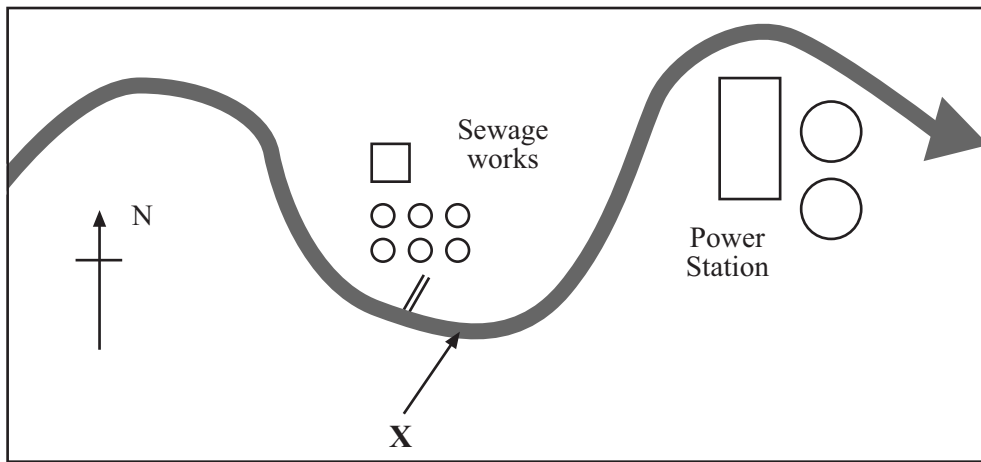
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(3 marks)

10

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 5 The sketch map shows locations along part of the course of a river which flows from west to east across the area.



- (a) A group of students planned to use indicator species to find out whether the sewage works was causing pollution in the river.

(i) Explain how indicator species can be used to monitor levels of water pollution.

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(4 marks)

(ii) The students planned to collect results only at the place marked **X** on the map. Their teacher said that this would not allow them to decide whether the sewage works was polluting the river. Explain why not.

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.....

(2 marks)

(iii) State **two** different types of pollution which might enter the river from a sewage works.

1.....

2.....

(2 marks)

(b) (i) The company which runs the sewage works has a discharge consent for the site. Explain what is meant by the term *discharge consent*.

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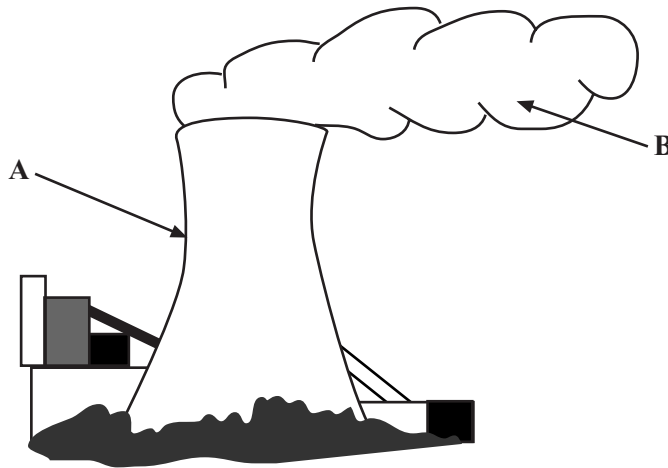
(2 marks)

(ii) Name the government agency which controls pollution in England and Wales.

.....

(1 mark)

(c) The sketch shows part of the power station shown on the map.



(i) Name the structure labelled **A**.

.....

(1 mark)

(ii) Name the substance labelled **B**.

.....

(1 mark)

(iii) Explain why structures like the one labelled **A** in the sketch can help to stop the power station from harming living organisms in the river.

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(3 marks)

Turn over ►

- 6 The table shows the results of an investigation into the amounts of sand, silt and clay in two samples of soil.

	Soil A		Soil B	
	Mass in grams	%	Mass in grams	%
Sand	206.4	86.0	25.0	10.0
Silt	24.0	10.0	90.0	
Clay	9.6	4.0	135.0	

- (a) (i) Calculate the percentage of silt and clay in **Soil B**. Write your answers in the correct spaces in the table. (2 marks)

- (ii) What term is usually used to refer to the proportions of sand, silt and clay in a sample of soil?

.....
(1 mark)

- (b) The table shows details of some characteristics of the two soil samples.

	Soil A	Soil B
Drainage		
Ease of cultivation		
Nutrient status	poor	good
Water-holding		

- (i) Complete the table by writing the words **good** or **poor** in the spaces provided. (2 marks)

- (ii) State which of the two soil samples you would expect to have the lower pH value and explain your choice.

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(2 marks)

- (c) Explain why soil is sometimes described as a renewable resource which can be converted into a non-renewable one.

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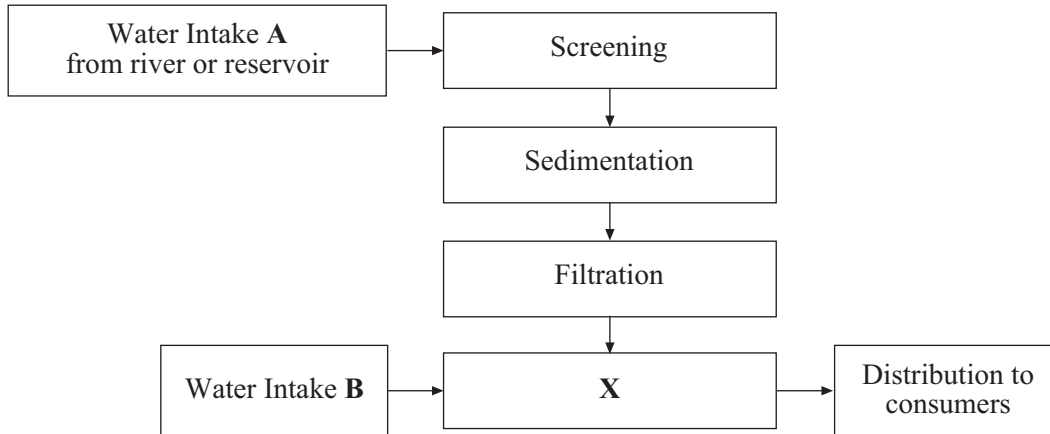
(3 marks)

10

TURN OVER FOR THE NEXT QUESTION

Turn over ►

7 (a) The diagram shows stages in the treatment and distribution of drinking water.



(i) Explain the purpose of sedimentation and filtration in the water treatment process.

Sedimentation.....
.....
.....

Filtration.....
.....
.....

(4 marks)

(ii) Name and explain the purpose of the process labelled X on the diagram.

.....
.....
.....
.....

(3 marks)

(iii) State the source of water used for Water Intake B and explain why it does not need as much treatment as water from Water Intake A.

.....
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.....
.....

(3 marks)

(b) (i) Explain how water meters can encourage people to conserve water.

.....
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(2 marks)

(ii) State **two** other methods of water conservation, **one** which can be used by water supply companies and **one** which can be used by people in their own homes.

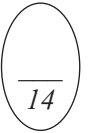
Used by water companies

.....

Used in homes

.....

(2 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

8 (a) The extract is from an article on the loss of crop biodiversity.

Selective breeding of new varieties leads to crop biodiversity crisis

- 50% of the food supply of the United States comes from only four crops – rice, wheat, maize and potatoes.
- Farmers in China grew 10 000 different varieties of wheat in 1949, but by the 1970s they only grew 1000.
- 80% of Mexican maize varieties have been lost since 1930.
- Since 1903 the US has lost over 90% of its varieties of lettuce, tomato and asparagus.

(i) What is meant by the word *biodiversity*?

.....
.....
(1 mark)

(ii) Explain how selective breeding of new varieties of crop plants might lead to changes like those described in the extract.

.....
.....
.....
.....
.....
(3 marks)

(iii) Some scientists are worried that changes such as those described in the extract may lead to major problems for food production in the future. Explain how this might happen.

.....
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.....
(3 marks)

- (iv) Imagine that you are a politician responsible for making important decisions about farm crops. State **one** piece of information you would need about the extract before using it to help you make any decisions. Give **one** reason for your answer.

Information needed

.....

Reason

.....

(2 marks)

- (b) Many modern breeds of farm livestock have been carefully selected for maximum output in a controlled environment.

What is meant by the term *controlled environment* in this statement?

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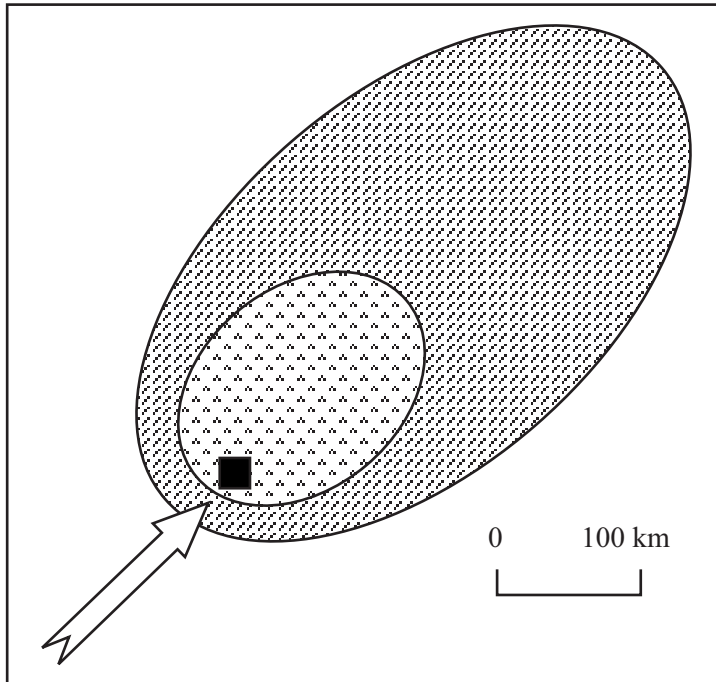
(2 marks)

11



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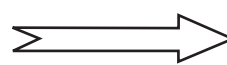
Turn over ►

9 (a) The map shows the areas affected by acid deposition from a large coal-fired power station.



Key



Prevailing wind direction



Power station

(i) Complete the key by writing the phrases **dry deposition** and **wet deposition** in the correct boxes. (1 mark)

(ii) Name **two** gases emitted by coal-fired power stations which may cause acid deposition.

1.....

2.....

(2 marks)

(iii) Acid deposition is an example of transboundary air pollution. What is the meaning of the phrase *transboundary air pollution*?

.....

.....

(1 mark)

- (b) The maps show changes in the distribution of *Lecanora muralis*, a species of lichen, in West Yorkshire in the United Kingdom between 1969 and 1990.

*The maps have not been reproduced here due to third-party copyright constraints.
 Printed copies of this paper can be obtained by ordering 3441/H from
 AQA Publications. Tel: 0161 953 1170*

- (i) What change took place in the distribution of this lichen species between 1969 and 1990?

.....

(1 mark)

- (ii) Explain how **one** change in the law and **one** change in technology may have helped to cause the distribution of the lichen to change in this way.

The law.....

Technology.....

(4 marks)

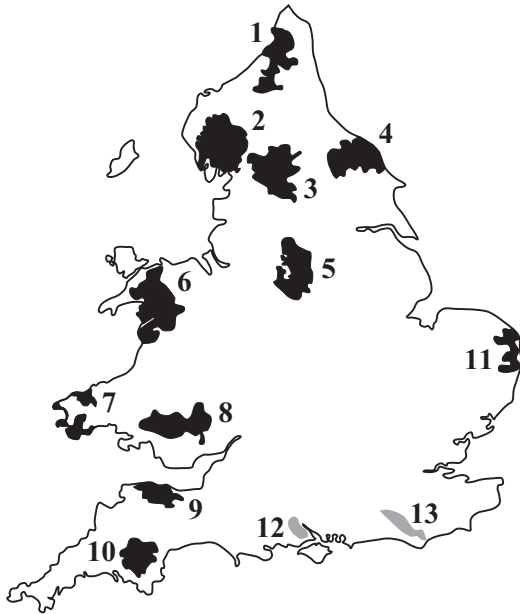
- (c) Describe how you could use lichens to carry out a survey of air pollution levels.

.....

(4 marks)

Turn over ▶

10 (a) The map shows the distribution of National Parks in England and Wales in 2001.



	Name and year of designation as a National Park
1	Northumberland (1956)
2	Lake District (1951)
3	Yorkshire Dales (1954)
4	North York Moors (1952)
5	Peak District (1951)
6	Snowdonia (1951)
7	Pembrokeshire Coast (1952)
8	Brecon Beacons (1957)
9	Exmoor (1954)
10	Dartmoor (1951)
11	The Broads (1989)
12	New Forest (not yet confirmed)
13	South Downs (not yet confirmed)

(i) What is the main purpose of the National Parks in the United Kingdom?

.....

 (1 mark)

(ii) State **one** difference between the distribution of the early National Parks designated during the 1950s and the ones designated or planned more recently.

.....

 (2 marks)

(b) The table shows details about the ownership of land in three National Parks.

	Land ownership (% of total area)		
	Lake District	Northumberland	Snowdonia
Private landowners	58.7	56.4	69.9
Forestry Commission	5.0	18.9	15.8
Ministry of Defence	0.2	22.6	0.0
Water companies	6.8	1.2	0.9
National Trust*	25.4	0.7	8.9
Other owners	3.9	0.2	4.5

*The National Trust is an organisation which works to conserve historic buildings, attractive landscapes and wildlife.

- (i) The Lake District National Park covers an area of 229 198 hectares. Calculate the area of the Park which is owned by the National Trust. Express your answer to the nearest hectare.

.....hectares (1 mark)

- (ii) Some people believe that the activities of some of the organisations which own land in the National Parks do not fit in with the aims of the National Parks. Choose **two** organisations from the table and for each one explain **a different reason** why some people may think that its activities do not fit in with the aims of the National Parks.

1.....

 2.....

(6 marks)

QUESTION 10 CONTINUES ON THE NEXT PAGE

Turn over ►

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