

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2004



**ENVIRONMENTAL SCIENCE
FOUNDATION TIER
Written Paper**

3441/F

F

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) Choose words from the box to complete the passage below.

chemical	electrical	generator	kinetic	motor	nuclear
pipe	turbine				

Large amounts of coal are used in power stations. Coal contains energy.

When the coal is burned heat is released and is used to boil water. This produces steam which

has energy. The steam passes through a which drives a

..... . This produces energy.

(5 marks)

- (b) The table shows the percentage of UK energy supplies obtained from different sources in 1970 and 2000.

Energy source	% of total energy used	
	1970	2000
Coal	47.1	16.1
Oil	44.0	32.9
Natural Gas	5.4	41.3
Nuclear	3.3	8.5
Renewable energy resources	0.2	1.2

- (i) Which energy source showed the greatest change in use between 1970 and 2000?

.....
(1 mark)

(ii) Calculate the percentage of UK energy supplies obtained from fossil fuels in 1970.
.....% (1 mark)

(iii) Calculate the percentage of UK energy supplies obtained from non-renewable sources in 2000.
.....% (1 mark)

(c) (i) State **two** advantages of using wind energy to produce electricity.

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

(ii) State **two** reasons why some people may be against the building of wind power stations.

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

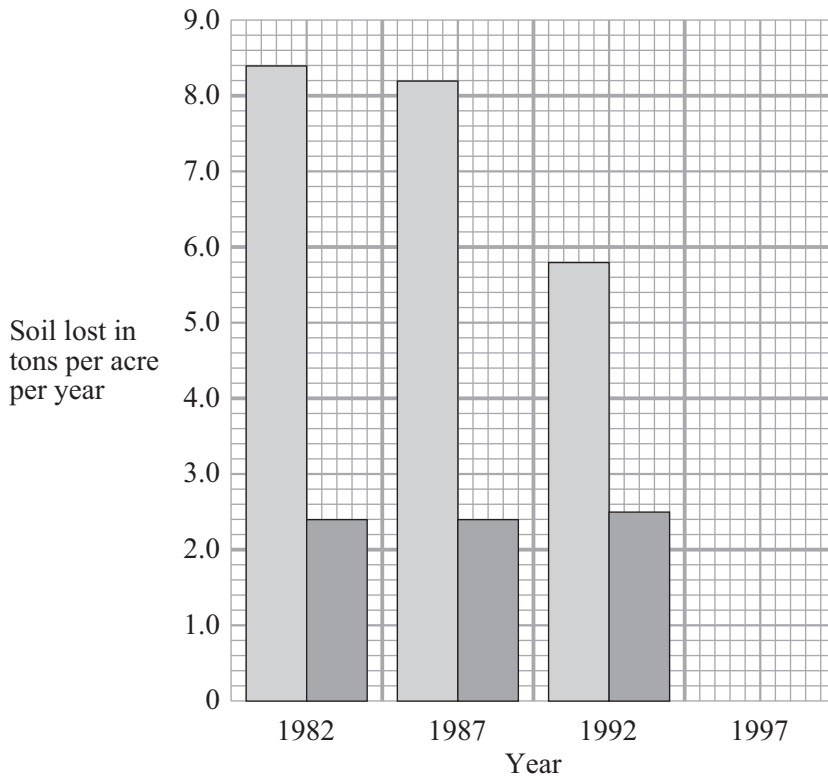
(iii) Name **two** other renewable energy resources.

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

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 2 (a) The chart shows the average amounts of soil lost by soil erosion from two different types of farm land in Kentucky, USA.



Key



Crop land (land used to grow crops such as wheat)



Pasture land (land always covered by grass used to feed farm animals)

- (i) Use the figures in the table below to complete the chart for 1997.

Average amount of soil lost in tons per acre per year in 1997	
Crop land	Pasture land
4.4	2.0

(2 marks)

- (ii) What was the average amount of soil lost from crop land in Kentucky in 1987?

.....tons per acre per year

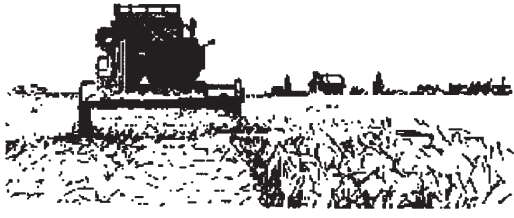

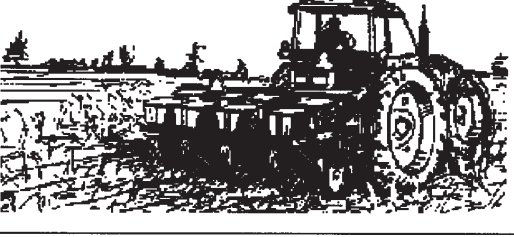

(1 mark)

- (iii) How much less soil was lost from crop land in Kentucky in 1992 than in 1982?

.....tons per acre per year

(1 mark)

- (b) The illustration shows a leaflet from the USA giving information about a method of reducing soil erosion called *no-till cropping*. In this method the soil is not ploughed or cultivated before planting each new crop.

	<p>Stems, stalks and leaves (crop residue) are left on the soil surface when crops are harvested.</p>
	<p>The crop residue protects the soil and provides shelter and food for wildlife.</p>
	<p>Seeds for the next crop are planted directly into the crop residue in small grooves or strips.</p>
	<p>The crop residue adds organic matter to the soil and limits the amount of water evaporating from the soil.</p>

- (i) Explain how this method can help to reduce soil erosion.

.....

.....

.....

.....

(2 marks)

- (ii) State **one** other advantage of this method.

.....

.....

(1 mark)

QUESTION 2 CONTINUES ON THE NEXT PAGE

Turn over ►

- (c) Suggest how a group of scientists could find out whether no-till cropping really causes less soil erosion.

You **do not** have to describe how they would actually measure the amount of soil lost.

You **must** explain how to make this a fair test.

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)

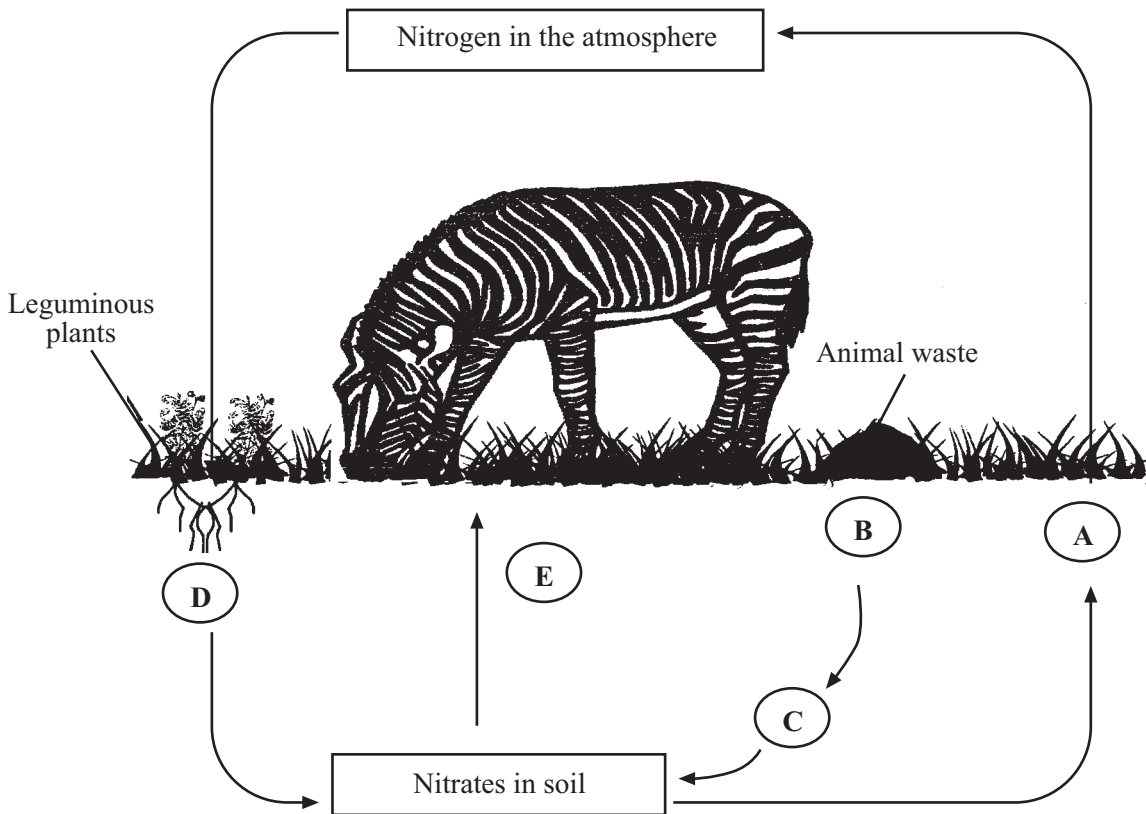
12

NO QUESTIONS APPEAR ON THIS PAGE

TURN OVER FOR THE NEXT QUESTION

Turn over ►

3 The diagram shows part of the nitrogen cycle in a natural ecosystem.



(a) (i) Complete the key to the groups of bacteria in the nitrogen cycle. Write the correct letter in each space. The first one has been done for you.

Putrefying bacteria	B
Denitrifying bacteria	
Nitrifying bacteria	
Nitrogen fixing bacteria	

(3 marks)

(ii) Give **one** reason why putrefying bacteria are important in ecosystems.

.....

.....

(1 mark)

(iii) In a natural ecosystem nitrogen in the atmosphere can be converted into nitrogen compounds in the soil in other ways as well as the ones shown on the diagram.

State **one** way, not shown on the diagram, in which this can happen.

.....

(1 mark)

(b) Natural ecosystems rely on the processes shown in the diagram but farmers need to add extra nutrients, including nitrogen, to their soil.

(i) Explain why farmers need to add extra nutrients to their soil.

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

(2 marks)

(ii) State **two** ways in which farmers could increase the nitrogen content of their soil without using artificial fertilizer.

1.....
2.....

(2 marks)

(c) Overuse of artificial fertilizers causes pollution which affects human health and the environment.

(i) State **one** effect on humans and explain how the pollution reaches them.

Effect.....
Explanation.....
.....
.....

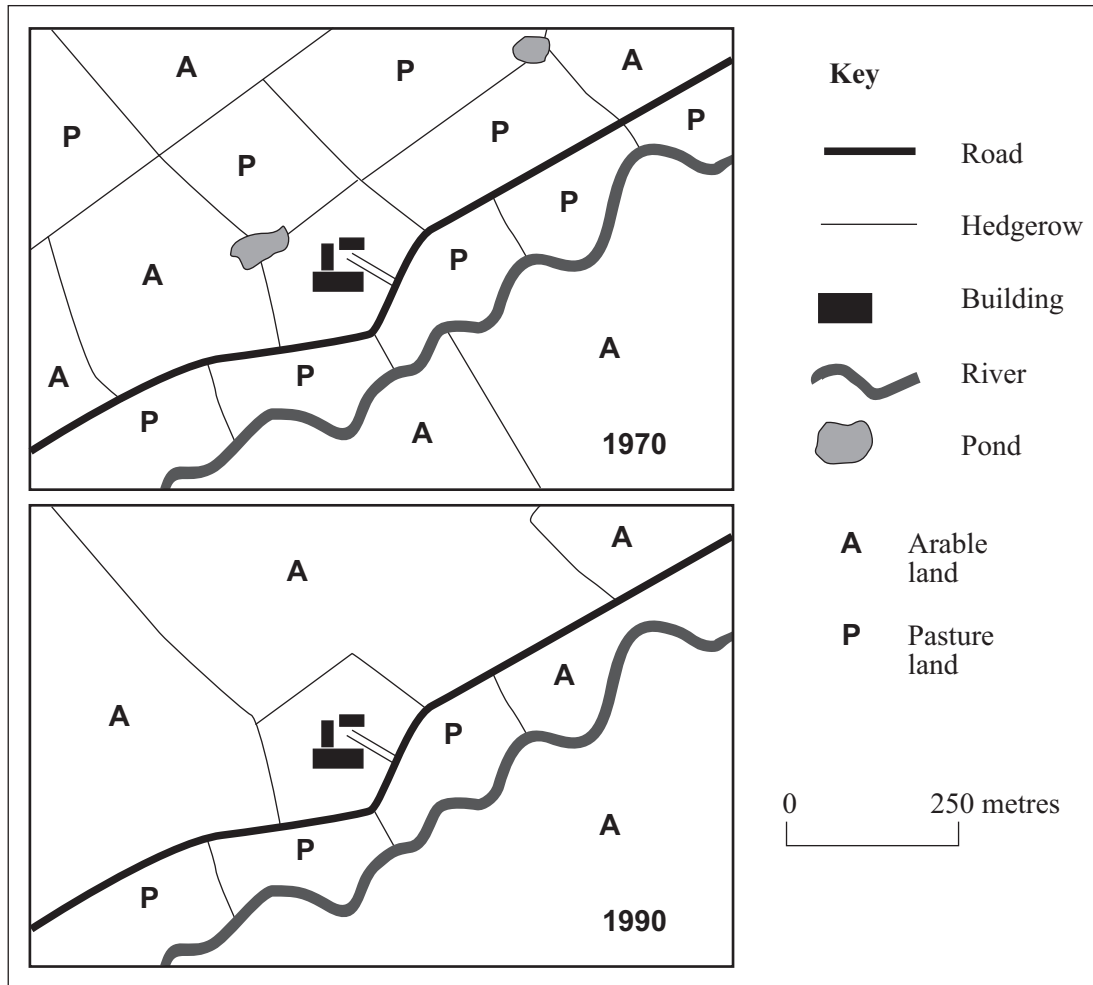
(2 marks)

(ii) State **one** effect on the environment and name **one** type of organism which could be affected by it.

Effect.....
.....
Organism.....

(2 marks)

4 (a) The maps show the same area of countryside in 1970 and 1990.



(i) Using evidence from the maps, state **one** change which took place in this area between 1970 and 1990. Give a reason for this change.

Change.....

.....

Reason.....

.....

(2 marks)

(ii) Conservationists protested against the changes shown on the two maps. State **two** reasons why they may have done so.

1.....

.....

2.....

.....

(2 marks)

(b) (i) Name the policy which regulates farming in the European Union.

.....
(1 mark)

(ii) During the 1980s farmers in Britain and other countries in the European Union overproduced milk, cereal crops and other things. Explain why this happened.

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.....
(2 marks)

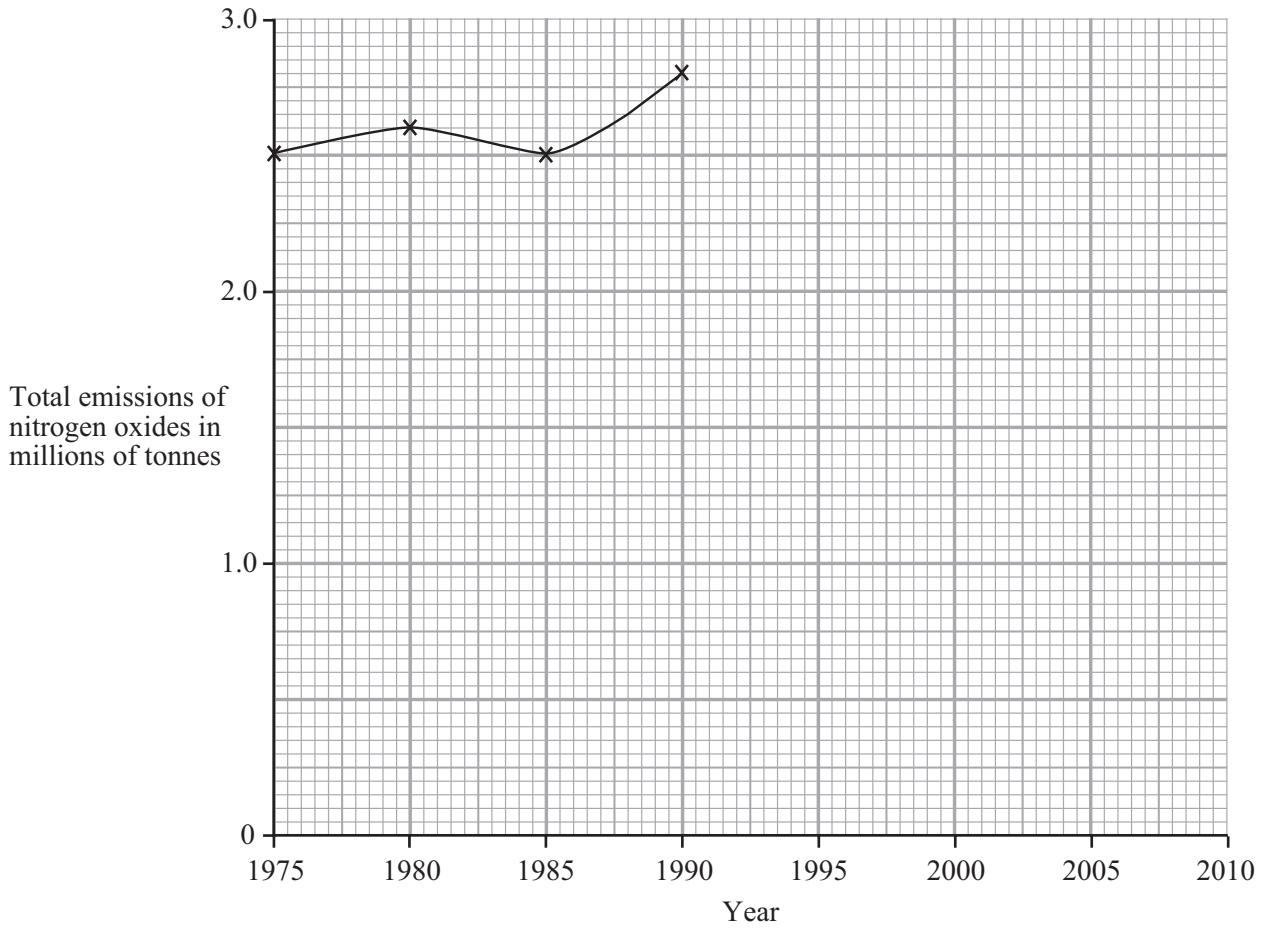
(iii) Describe **two** things which were done to cut down overproduction.

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

(c) Explain what is meant by organic farming.

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

- 5 (a) The graph shows changes in the amount of oxides of nitrogen emitted into the atmosphere in the UK.



- (i) Use the graph to estimate the amount of nitrogen oxides emitted in 1979.
million tonnes (1 mark)
- (ii) Use the figures for 1995 and 2000 in the table below to complete the graph.

Year	Amount of nitrogen oxides in millions of tonnes
1995	2.1
2000	1.5

(2 marks)

- (iii) The European Union has set a target of 1.2 million tonnes of oxides of nitrogen for the UK in 2010.

Use your graph to help you decide whether this target is likely to be met or not.

Tick one of the boxes to show your decision.

Target likely to be met

Target not likely to be met

Explain your decision

.....

.....

.....

(3 marks)

- (iv) State **one** change in technology which may help to explain the change in the amounts of nitrogen oxides emitted after 1990.

.....

(1 mark)

- (b) Nitrogen oxides are one cause of acid deposition. Sulphur dioxide also helps to cause this problem.

- (i) Describe **two** methods which can be used to reduce the amount of sulphur dioxide given off into the atmosphere.

1.....

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2.....

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(4 marks)

- (ii) State **two** ways in which the natural environment can be harmed by acid deposition.

1.....

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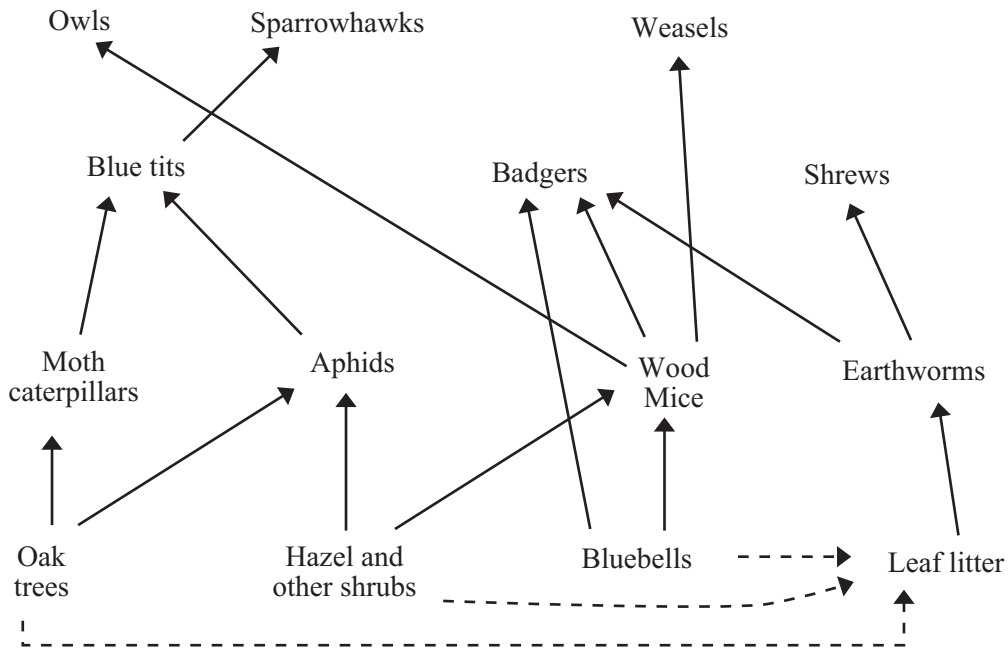
2.....

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(2 marks)

Turn over ►

6 (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)

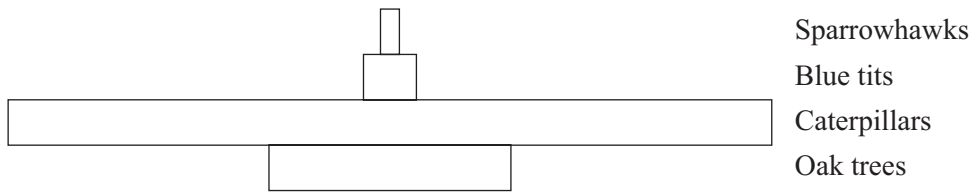
(ii) Using the diagram, name **two** organisms which feed on Wood Mice.

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)

7 (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 ►

8 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

.....

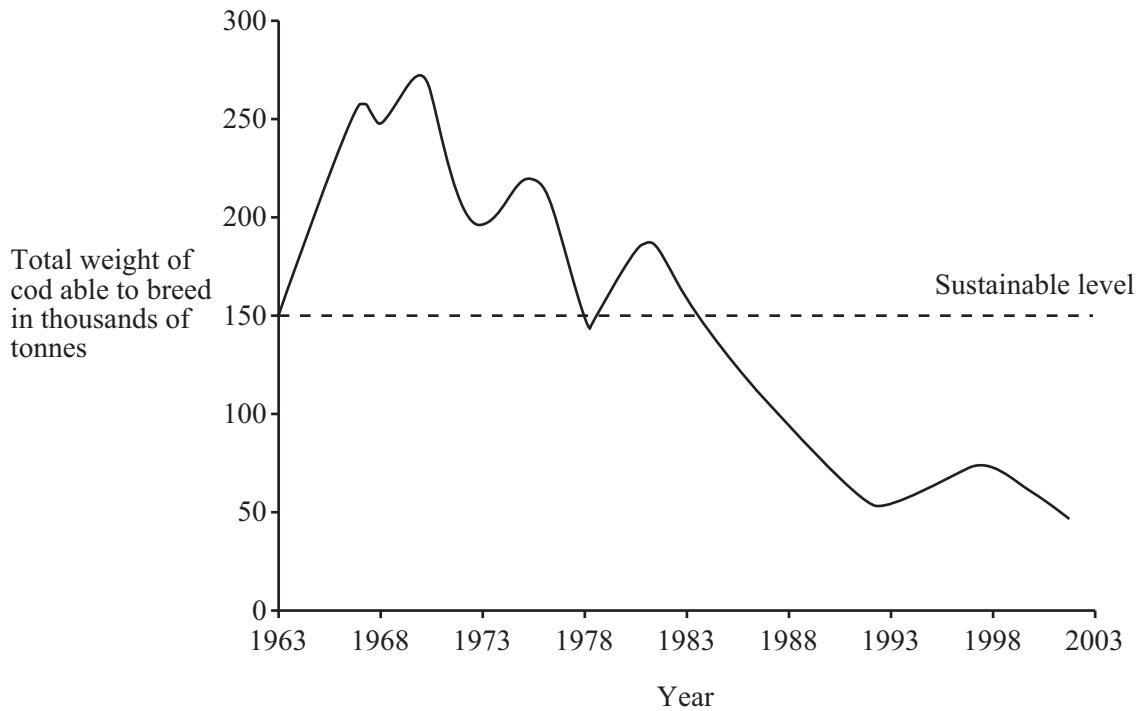
(2 marks)

$\frac{\quad}{10}$

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 9 (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.

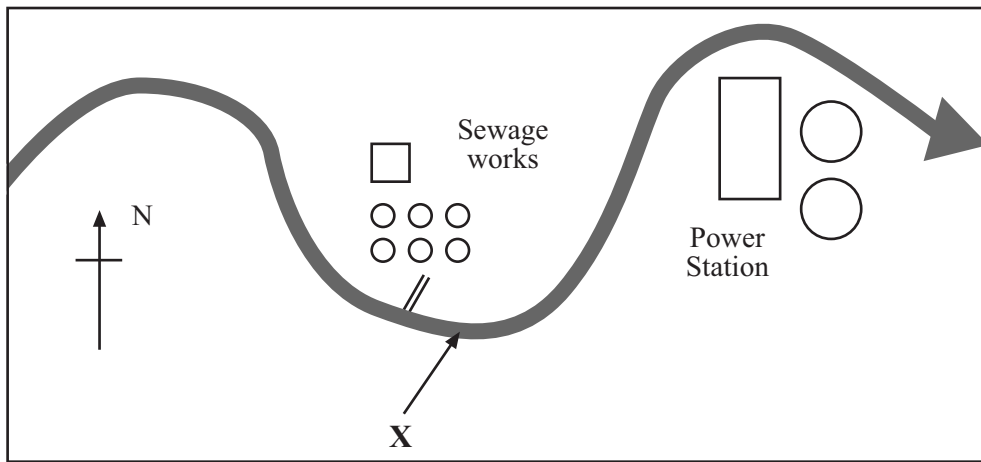
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(3 marks)

10

TURN OVER FOR THE NEXT QUESTION

Turn over ►

10 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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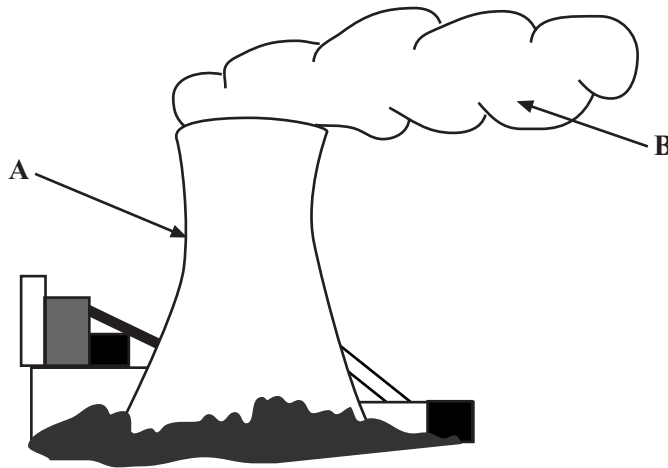
(2 marks)

- (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)

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE