

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2008

ENVIRONMENTAL SCIENCE
Written Paper
Higher Tier

3441/H
H



Tuesday 17 June 2008 9.00 am to 11.00 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler. <p>You may use a calculator.</p>

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

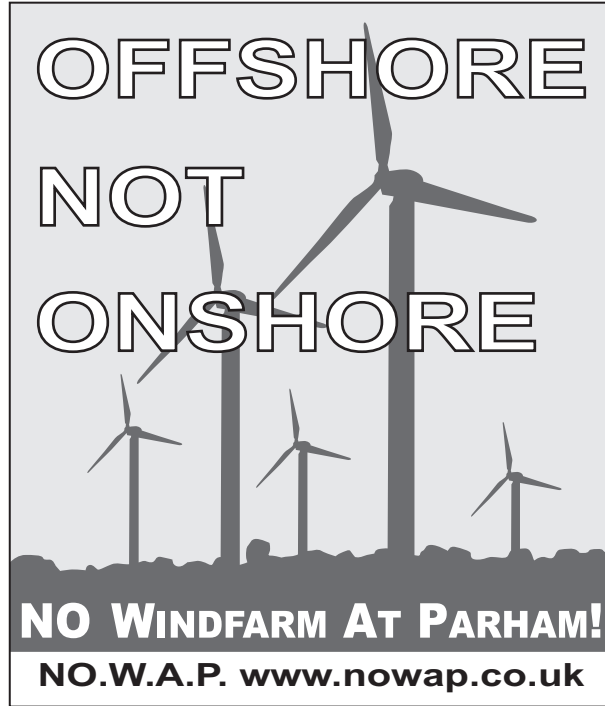
- The maximum mark for this paper is 120.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers. Questions 1(a)(iii) and 6(a) should be answered in continuous prose. Quality of Written Communication will be assessed in these answers.

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



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

- 1 (a) The picture shows a poster put up by a group of people protesting against a plan to build a windfarm.



- 1 (a) (i) State and explain **two** reasons why some people are against windfarms.

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(4 marks)



1 (a) (ii) Suggest **one** reason why the protesters may think that it is better to build windfarms offshore rather than on land.

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(1 mark)

1 (a) (iii) Some scientists believe that we should use more wind power rather than continuing to burn fossil fuels as much as we do now. Explain **one** reason for this.

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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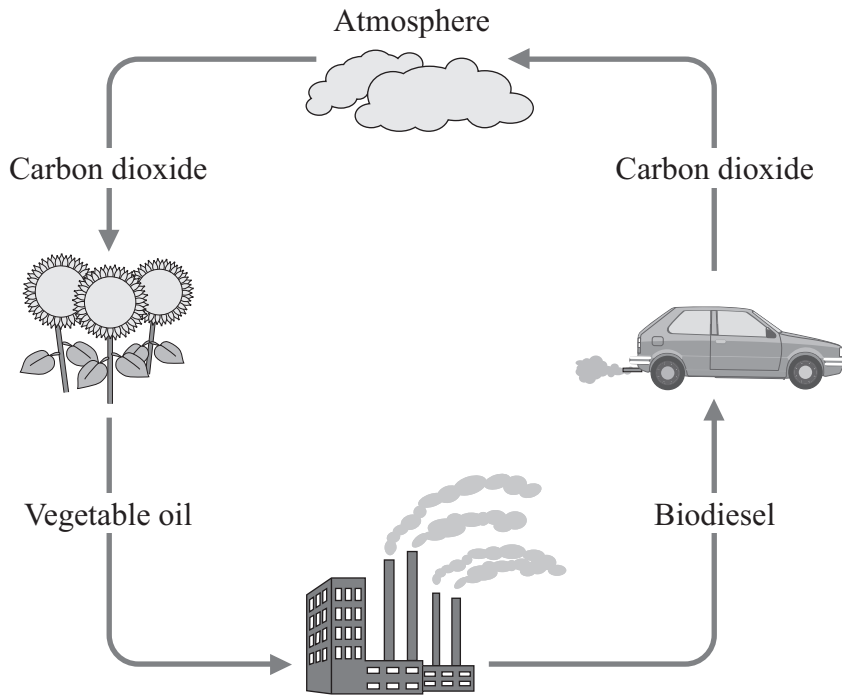
(3 marks)

Question 1 continues on the next page

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- 1 (b) The diagram shows stages in the production and use of biodiesel, which is a biofuel.



- 1 (b) (i) Plants use carbon dioxide from the atmosphere in a process which produces new biomass.
Name this process.

.....
(1 mark)

- 1 (b) (ii) Carbon dioxide is given off when biodiesel is burnt as a fuel.
Explain why this does not cause an overall increase in the amount of carbon dioxide in the atmosphere.

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(2 marks)



Turn over for the next question

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0 5

2 (a) The photograph shows machinery working in a limestone quarry.



Source: Courtesy of E. GLYNN BECK *Kentucky Geological Survey, (USA)*

2 (a) (i) Describe **one** problem which a quarry could cause for people living nearby.

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(2 marks)

2 (a) (ii) Suggest **one** method which could be used to reduce the problem which you described in part 2(a)(i).

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(1 mark)

2 (a) (iii) Describe **one** way in which a quarry could affect the natural environment.

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(2 marks)



2 (a) (iv) State **two** reasons why people may be in favour of quarries.

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(2 marks)

2 (b) Limestone is used to make cement.
State **two** other uses of limestone.

1

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(2 marks)

2 (c) In November 2005 the UK government organisation which controls pollution announced a plan to improve the environmental performance of the cement industry.

2 (c) (i) Name the UK government organisation which controls pollution.

.....

(1 mark)

2 (c) (ii) Two of the targets set for the cement industry are given below.
For each target state **one** way in which it would help to improve the environment.

Target 1: To reduce the use of fossil fuels.

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Target 2: To increase the amount of energy obtained by burning waste products such as old tyres.

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(2 marks)

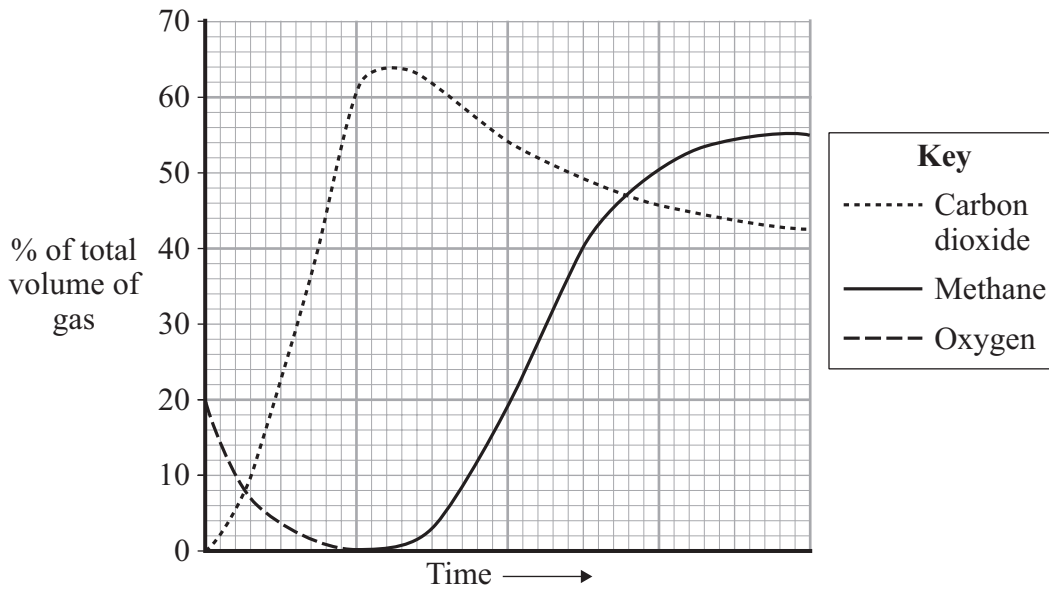
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3 (a) The graph shows the gases given off from a landfill site after rubbish has been tipped and covered over. This mixture of gases is usually called landfill gas.



3 (a) (i) Describe the changes in the percentages of oxygen and methane shown by the graph.

Oxygen

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Methane

.....

(4 marks)

3 (a) (ii) Name the process which produces methane gas in a landfill site.

.....

(1 mark)



3 (a) (iii) State **one** reason why methane gas does not begin to be produced as soon as the rubbish is tipped.

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(1 mark)

3 (b) The box gives some information about methane.

- Methane can be burnt in air to release heat energy.
- When one molecule of methane is burnt in air it produces one molecule of carbon dioxide and two molecules of water.
- Methane is approximately 21 times more powerful as a greenhouse gas than carbon dioxide.

If landfill gas is not used as a fuel it can either be allowed to escape into the atmosphere or it can be collected and simply burnt, without using the heat. Explain why pollution control scientists believe that it is better to burn the gas, even if the heat is not used. Use information from the box to help you.

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(2 marks)

3 (c) Describe how landfill gas can be used to produce electricity.

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(4 marks)

12

Turn over ►



4 (a) The photographs show two methods of keeping hens to produce eggs.

Photograph A shows hens being kept in battery cages in a controlled environment.

Photograph B shows free-range hens.

Photograph A



Photograph B



Source of photographs: Compassion in World Farming Trust (2006)

4 (a) (i) State **two** ways in which the conditions for the hens in **Photograph A** are controlled.

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(2 marks)

4 (a) (ii) Explain **one** reason why some people may be against the method shown in **Photograph A**.

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(2 marks)



4 (a) (iii) Explain why eggs produced by free-range hens are usually more expensive than eggs produced by hens in battery cages.

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(2 marks)

4 (b) Explain how a controlled environment can be used to increase the yield of crops such as tomatoes.

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(3 marks)

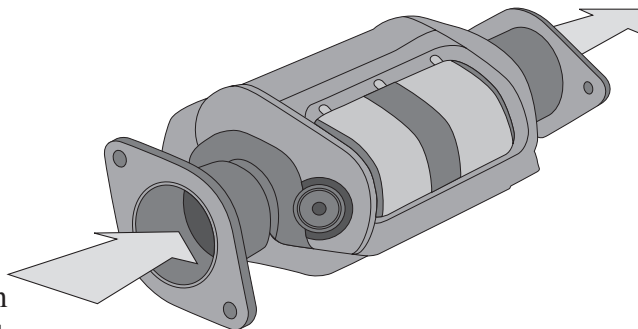
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5 (a) The picture shows a catalytic converter.



From car engine:

- Carbon monoxide
- Oxides of nitrogen
- Unburnt hydrocarbons

Into the atmosphere:

- Carbon dioxide
- Nitrogen
- Water vapour

5 (a) (i) State **one** reason why it is important to reduce the amount of carbon monoxide in the exhaust gases from motor vehicles.

.....

(1 mark)

5 (a) (ii) A student wrote the following statement in an examination answer:
 ‘Catalytic converters help to reduce global warming.’
 State whether you think that the statement is right or wrong.
 Explain your answer.

The statement is

Explanation

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(2 marks)

5 (a) (iii) Name the type of pollution which is formed when oxides of nitrogen and unburnt hydrocarbons in the atmosphere are exposed to bright sunlight.

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(1 mark)

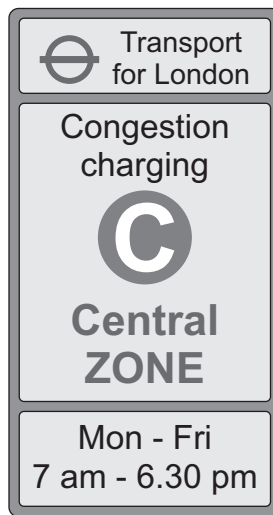


5 (a) (iv) Describe **one** other type of pollution which can be made worse by oxides of nitrogen in the atmosphere.

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(2 marks)

5 (b) The sign below is about the congestion charge in London. Drivers must pay a charge if they want to drive into the centre of the city. There are plans for similar schemes in other cities.



Explain why many people are in favour of schemes to control traffic congestion.

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(4 marks)

10

Turn over ►



6 (a) Describe the processes involved in the formation of fossil fuels.

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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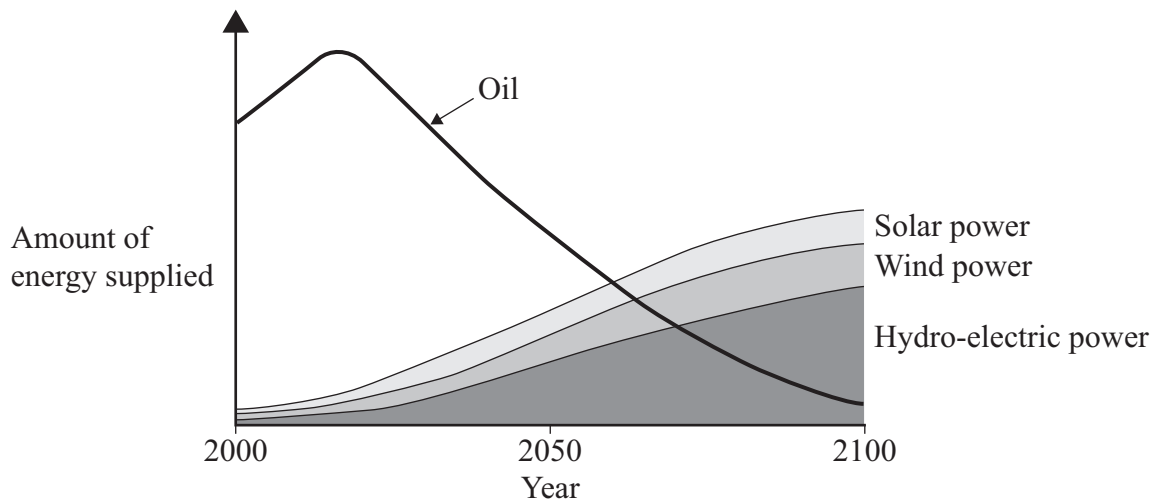
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(5 marks)

6 (b) The diagram shows what some people think may happen to the world's energy supplies during the twenty first century.



6 (b) (i) What does the diagram suggest about the future of the world's energy supplies?

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(2 marks)

6 (b) (ii) The diagram does not show all possible energy resources. Complete the table with the names of energy resources not included on the graph. Write your answers in the spaces provided.

Another fossil fuel	
Another renewable energy resource which uses moving water	
A non-renewable energy resource which is not a fossil fuel	

(3 marks)

6 (c) Explain **one** reason why the large-scale use of fossil fuels is **not** sustainable.

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(2 marks)

12

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- 7 (a) The box gives details of a method to find the water content of a sample of soil.

- 1 Weigh the sample of soil. Record this mass as M_1
- 2 Dry the sample of soil in an oven at 110°C
- 3 Weigh the dried sample of soil and record this mass
- 4 Dry and weigh the sample of soil again
- 5 Repeat Step 4 until you obtain two identical results, one after the other
Record this mass as M_2
- 6 To calculate the % of water in the sample of soil use the formula:

$$\% \text{ water content} = \frac{M_1 - M_2}{M_1} \times 100$$

- 7 (a) (i) State **one** reason why it is important to dry and weigh the sample of soil again (Step 4 of the method).

.....

(1 mark)

- 7 (a) (ii) A sample of soil weighed 40 grams when it was collected. It weighed 32 grams after it had been dried.
Calculate the percentage water content of this sample of soil.

..... %

(1 mark)



7 (b) A group of students were comparing the moisture content of soils in two fields. One of the students wrote this description of the method they used:

‘We investigated two different fields on the same farm. We collected twenty samples of soil from each field. All the samples were collected between 10:00 am and 10:15 am on 12 February 2007. The weather was fine all the time.’

7 (b) (i) The students tried to make sure that they could compare the soils from the two fields fairly. State and explain **one** thing mentioned in the description which would have helped them to do this.

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(2 marks)

7 (b) (ii) State and explain **two** other precautions, not mentioned in the description, which would have helped the students to make a fair comparison of the soils from the two fields.

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(4 marks)

Question 7 continues on the next page

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7 (b) (iii) The table shows the mean soil moisture content for each of the fields. State which field is more likely to have a clay soil. Explain your answer.

Field	Moisture content in %
Field A	8
Field B	22

Field is more likely to have a clay soil.

Explanation

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(2 marks)

7 (b) (iv) Describe **one** method which you could use to find out the texture of a sample of soil.

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(3 marks)



8 (a) (iv) Explain why deforestation can lead to an increase in the amount of carbon dioxide in the atmosphere.

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(2 marks)

8 (b) (i) Explain how an increase in the amount of carbon dioxide in the atmosphere may cause changes in the Earth's climate.

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(4 marks)

8 (b) (ii) When the temperature of water increases the amount of carbon dioxide that it can hold in solution decreases.
Explain why this fact makes some scientists believe that global warming may increase. Use information from the diagram to help you.

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(4 marks)



8 (b) (iii) Explain why planting more trees is unlikely to provide a complete solution to the problem of increasing amounts of carbon dioxide in the atmosphere.
Use information from the diagram to help you.

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(2 marks)

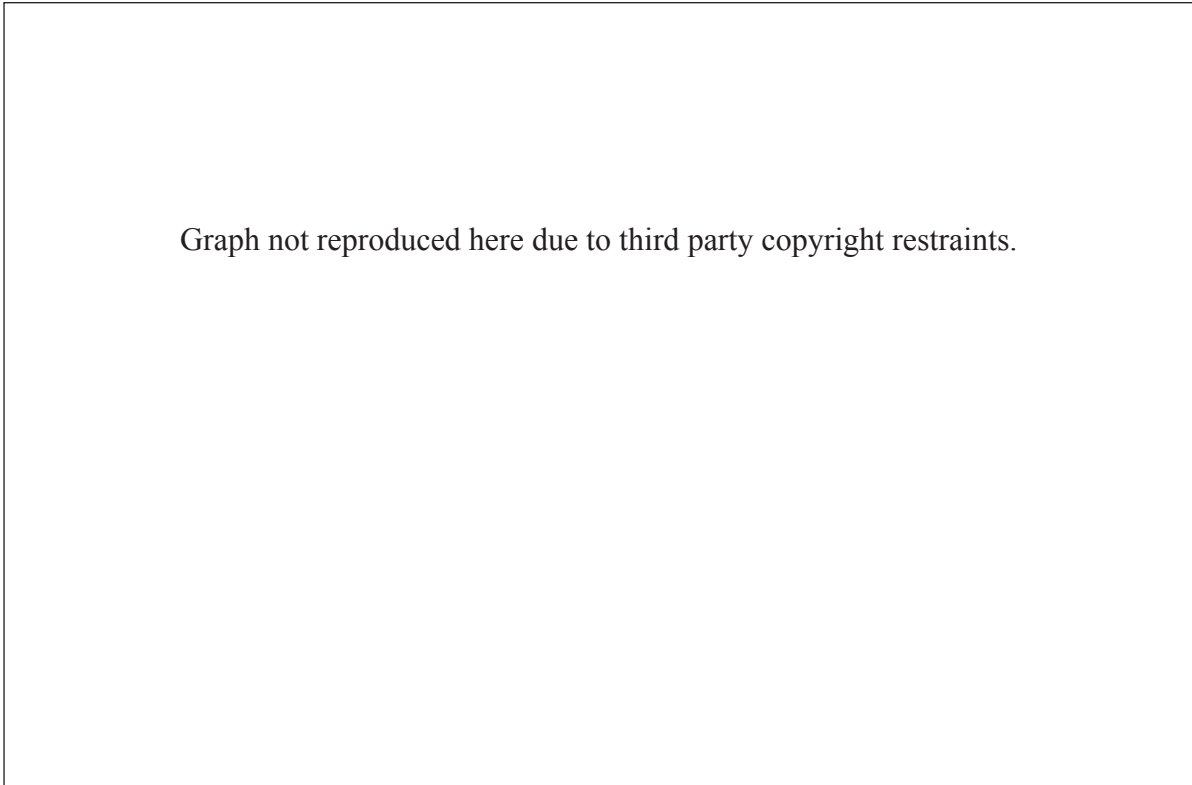
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- 9 (a) The graph shows the minimum amounts of ozone over Antarctica each year from 1980 until 2005.



- 9 (a) (i) Describe and explain the trends shown by the graph.

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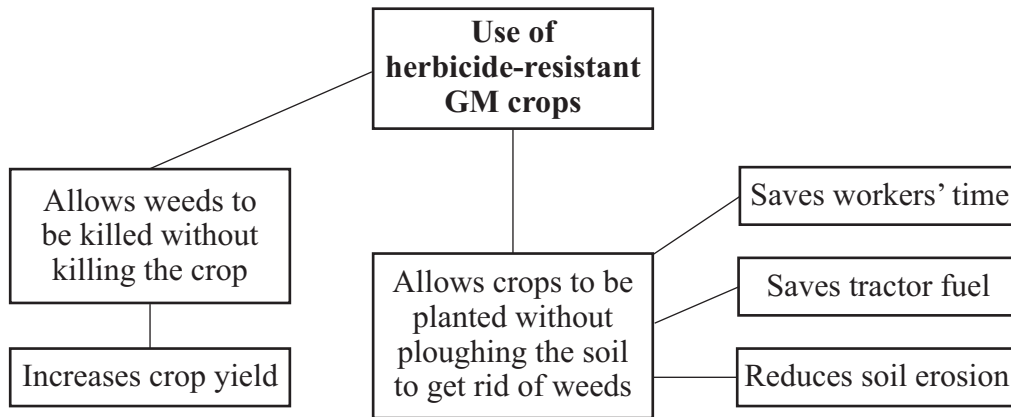
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(4 marks)



- 10 (a) Scientists have produced genetically-modified (GM) crop plants. Some of these crops are not killed by herbicides (chemicals used to kill weeds). The diagram shows some of the advantages of using these herbicide-resistant crops.



- 10 (a) (i) Explain **one** reason why farmers want to get rid of weeds.

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(2 marks)

- 10 (a) (ii) State **one** way in which using herbicide-resistant GM crops can reduce farmers' costs.

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(1 mark)

- 10 (a) (iii) Explain how using herbicide-resistant GM crops can help to reduce soil erosion.

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(2 marks)



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