

Surname						Other Names					
Centre Number						Candidate Number					
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General Certificate of Education  
 June 2003  
 Advanced Level Examination



**ENVIRONMENTAL SCIENCE** **ESC5**  
**Unit 5 Pollution and Physical Resource Management**

Monday 23 June 2003 Morning Session

**No additional materials are required.**  
 You may use a calculator.

Time allowed: 1 hour 30 minutes

**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. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

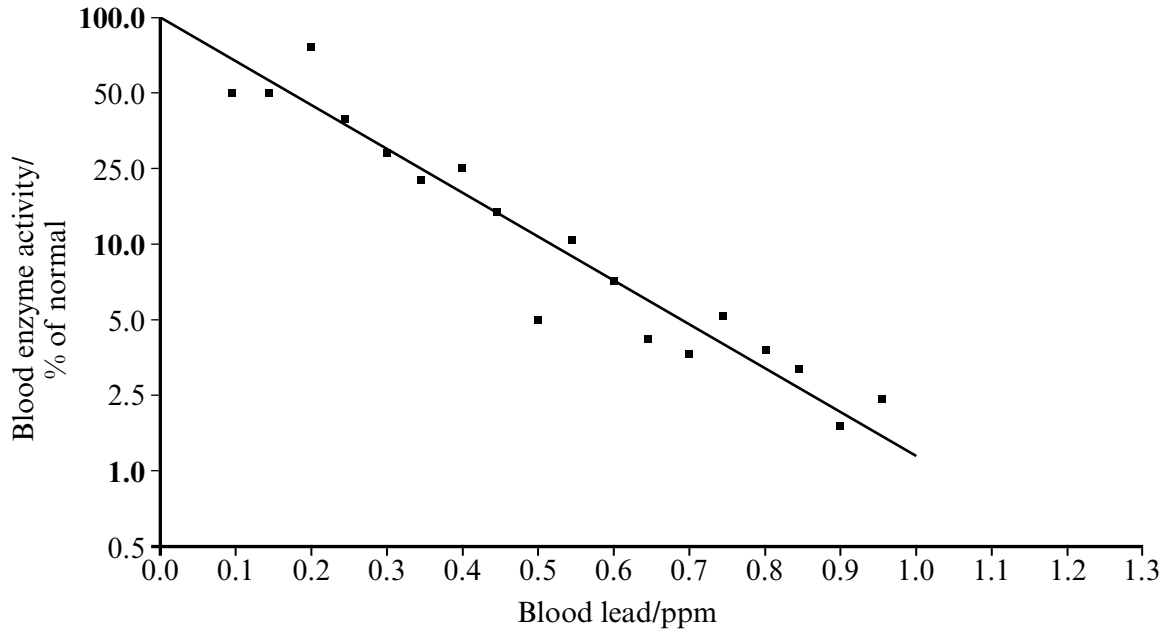
**Information**

- The maximum mark for this paper is 70.
- Mark allocations are shown in brackets.
- You are expected to use a calculator where appropriate.
- This unit assesses your understanding of the relationship between the different aspects of Environmental Science.
- You will be assessed on your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
- The degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
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8			
Total (Column 1)			
Total (Column 2)			
TOTAL			
Examiner's Initials			

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

1 The graph shows the effect of different concentrations of lead in human blood on the activity of a blood enzyme.



(a) Use the graph to estimate the concentration of blood lead required to stop all activity of the blood enzyme.

Blood lead concentration .....  
(1 mark)

(b) Give a major source of lead pollution and outline **one** major pathway by which lead from this source may enter the human body.

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(2 marks)

(c) Describe how lead affects human health.

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(2 marks)

2 The half-life of a radioactive isotope is an important factor to consider when assessing the threat to people.

(a) Complete the table below by adding the appropriate time period or fraction.

Radioisotope	Half-life	Time since release	Fraction of isotope remaining
Strontium 90	28 years	84 years	$\frac{1}{8}$
Caesium 137	30 years	30 years	
Iodine 131	8 days		$\frac{1}{32}$

(1 mark)

(b) Nuclear weapons tests during the 1960s released Strontium 90 into the atmosphere and the accident at Chernobyl nuclear power station in 1986 released Iodine 131 into the atmosphere.

Comment on the threat these releases pose to people born today.

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(2 marks)

(c) Trace the pathways by which Iodine 131 from Chernobyl, 2300 km away, may have entered the bodies of people in England.

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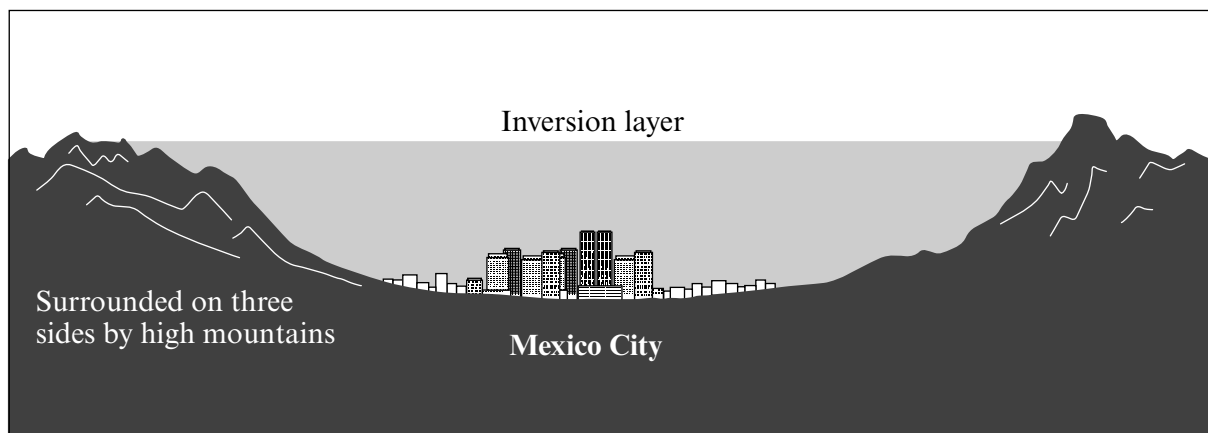
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(3 marks)

6

Turn over ►

- 3 The diagram shows Mexico City where the topography, climate and pollution combine to produce photochemical smogs.



- (a) (i) Name the **three** main pollutant gases which react during photochemical smogs to produce Peroxy Acetyl Nitrates (PANs).

Pollutant 1 .....

Pollutant 2 .....

Pollutant 3 .....

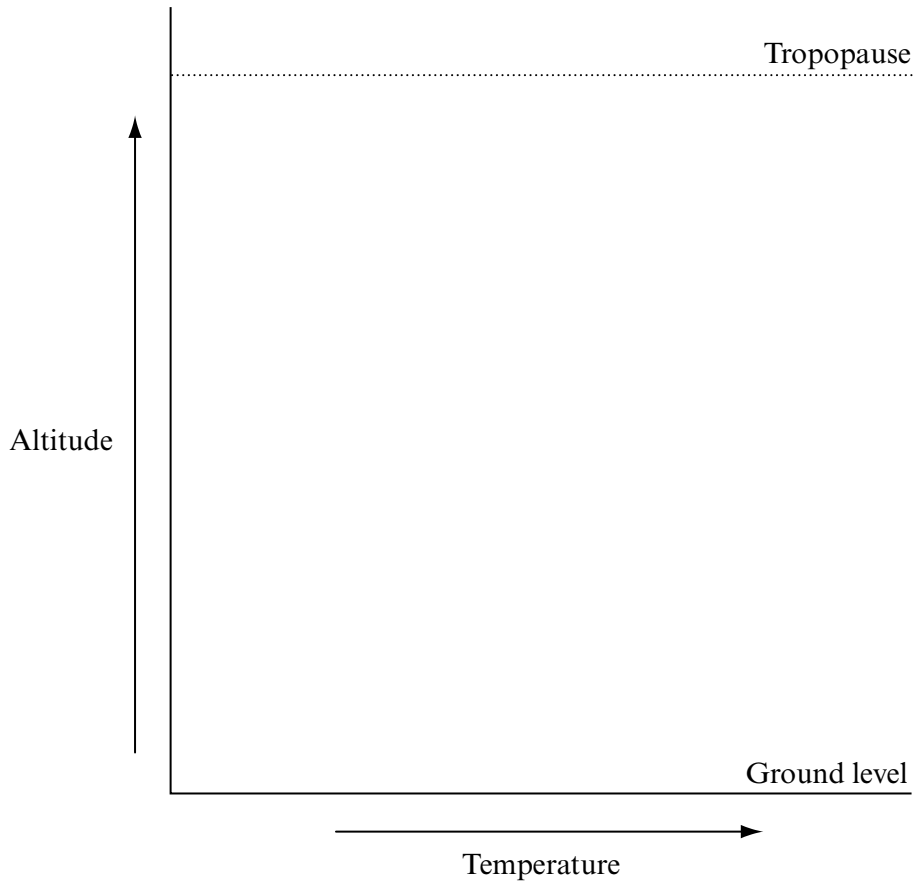
(1 mark)

- (ii) What is the source of the energy which causes the chemical reactions during a photochemical smog?

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(1 mark)

- (b) (i) Draw a line on the diagram to show the temperature changes with increasing altitude during a temperature inversion.



(1 mark)

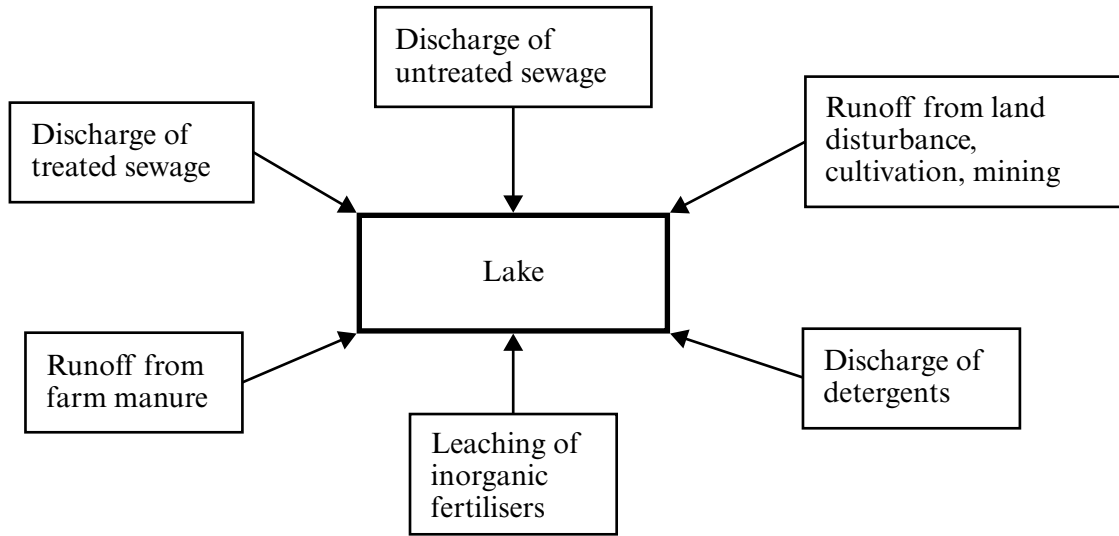
- (ii) Explain how a temperature inversion may trap pollutants close to ground level and prevent their dispersal.

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(3 marks)

Turn over ►

4 The diagram shows some of the causes of the eutrophication of a lake.



Describe how inorganic nutrients entering a lake may lead to it becoming deoxygenated.

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(4 marks)

4

5 For a company to gain the consent of the Environment Agency to release a new effluent into a river it may be necessary to treat the effluent before its release.

(a) Describe how such an effluent may be treated to reduce its heavy metal content.

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*(2 marks)*

(b) Explain how the characteristics of a river may affect the severity of pollution caused by effluents.

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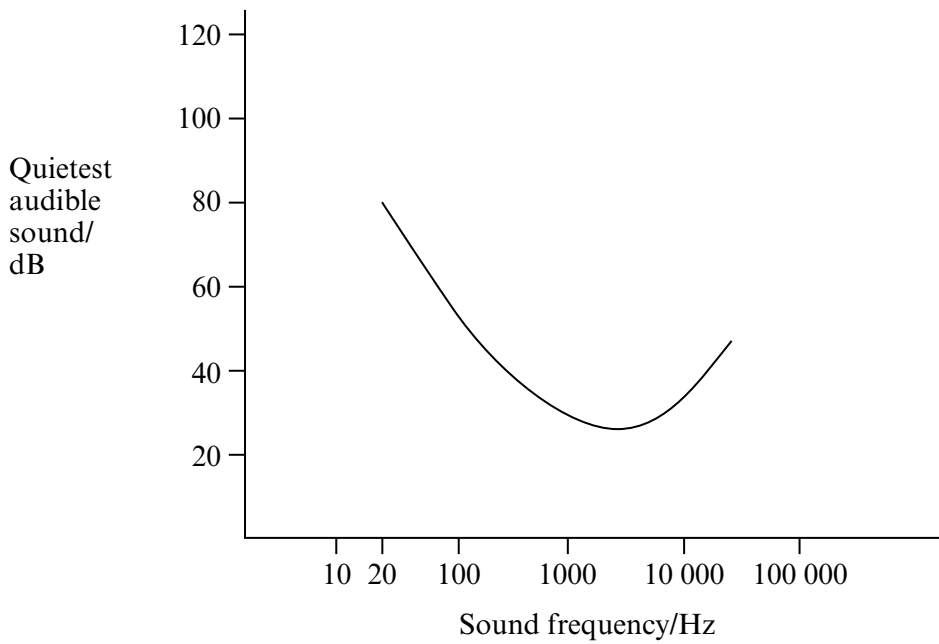
*(3 marks)*



**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

6 The graph shows the hearing sensitivity, to a range of sound frequencies, of a person with good hearing.



- (a) (i) Draw a line on the graph to show the hearing sensitivity of someone with hearing damage caused by noise pollution. (1 mark)
- (ii) Suggest why the graph does not give results for hearing below a frequency of 20 Hz.

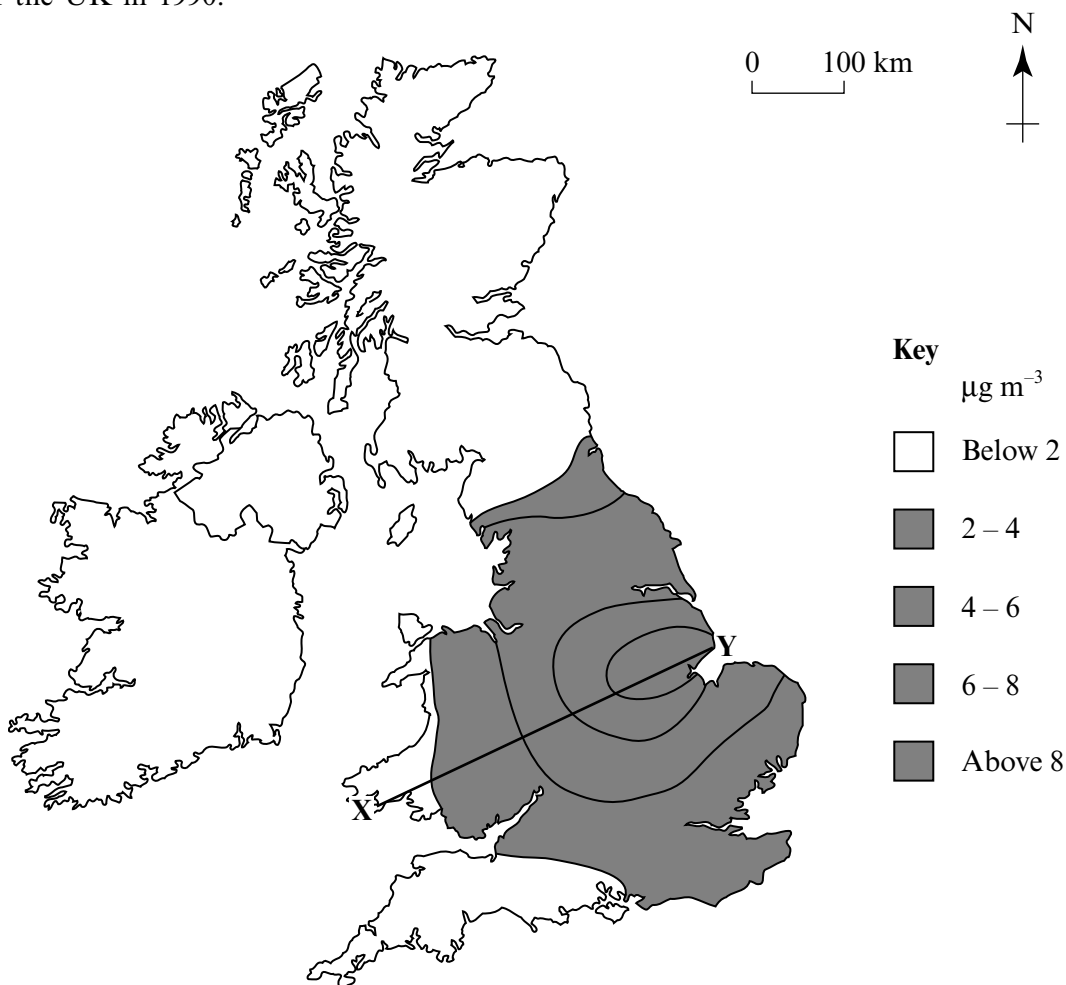
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(1 mark)

(b) Explain how the noise pollution experienced by residents near an airport could be reduced.

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(2 marks)



7 The map shows the annual mean atmospheric concentrations of sulphur dioxide in rural areas of the UK in 1990.



(a) Suggest **two** reasons to explain the distribution of the areas of different sulphur dioxide concentrations shown on the map.

- 1. ....
- .....
- 2. ....
- .....

(2 marks)

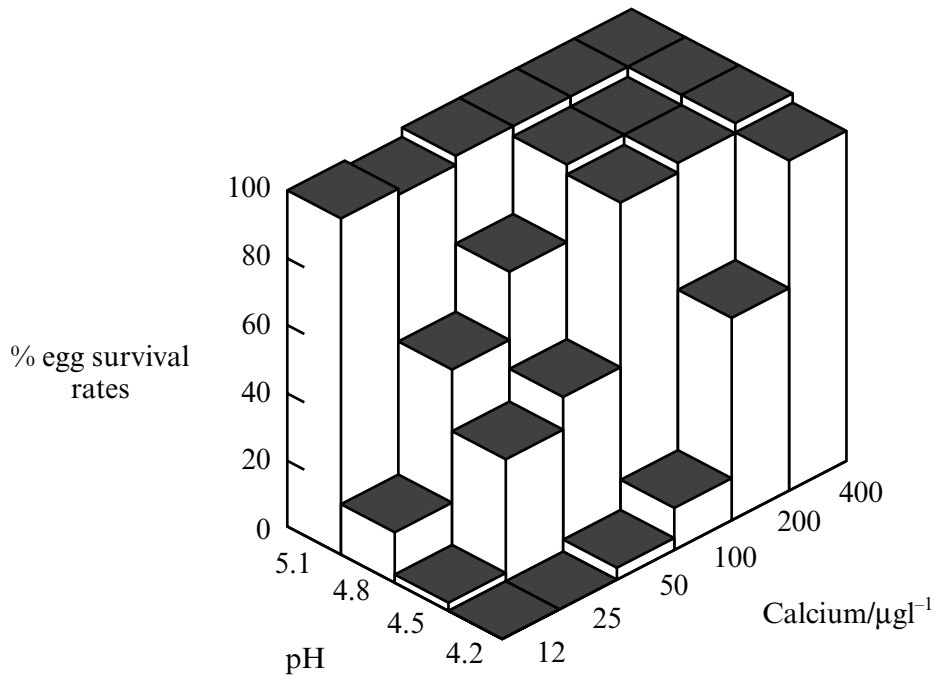
(b) Suggest the changes which may be observed in the lichen populations between points X and Y shown on the map.

- .....
- .....
- .....
- .....

(2 marks)

Turn over ►

- (c) The diagram shows the percentage survival of fertilised trout eggs in a range of pH and calcium concentrations.



- (i) Describe the effect on egg survival rates of increasing the acidity of water at a calcium concentration of  $100 \mu\text{g l}^{-1}$ .

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(2 marks)

- (ii) Describe the effect on egg survival of reducing calcium levels in water of pH 4.2.

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(2 marks)

(d) Describe ways in which acid rain can harm plants.

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*(4 marks)*

**QUESTION 7 CONTINUES ON THE NEXT PAGE**

**Turn over ►**

(e) Describe the ways in which the release of **two** named gases which cause acid rain may be controlled.

Gas .....

Control method .....

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(4 marks)

Gas .....

Control method .....

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(4 marks)

