

Surname						Other Names					
Centre Number						Candidate Number					
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For Examiner's Use

General Certificate of Education
 January 2007
 Advanced Subsidiary Examination



ENVIRONMENTAL SCIENCE
Unit 2 The Lithosphere

ESC2

Wednesday 17 January 2007 9.00 am to 10.00 am

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

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

Time allowed: 1 hour

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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 60.
- 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 6 should be answered in continuous prose. Quality of Written Communication will be assessed in this answer.

There are no questions printed on this page

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

- 1 Complete the table by putting ticks to indicate whether the statements are true or false.

Statement	True	False
The primary purpose of a Country Park is to protect wildlife		
The main use of china clay is in brick-making		
The cut-off grade is the deepest ore that is economically worthwhile extracting		
Cost benefit analysis can be used to resolve land use conflicts		
Both sand and gravel are used to make concrete		

(5 marks)

5

Turn over for the next question

2 (a) Describe each of the following weathering processes.

(i) Hydration

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(2 marks)

(ii) Hydrolysis

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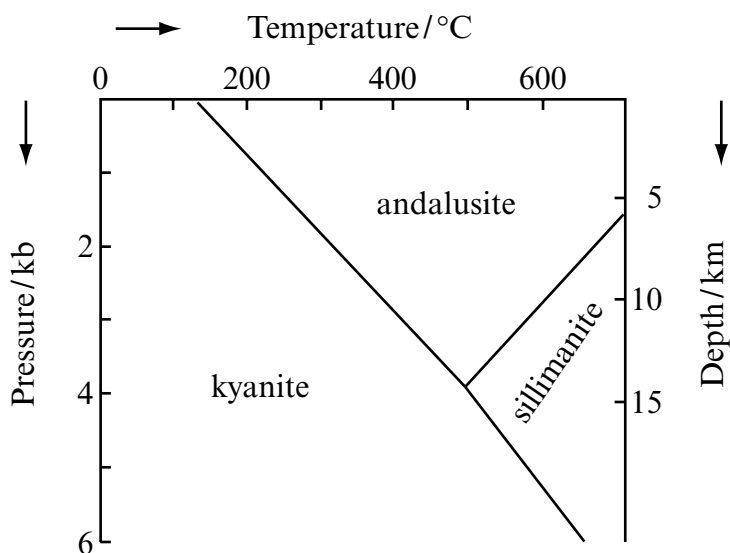
(2 marks)

(iii) Carbonation.

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(2 marks)

- (b) The form of minerals found in rocks at the surface will change when they become deeply buried. The graph shows a mineral which can exist in three different forms: andalusite, kyanite and sillimanite. The form that exists depends upon the temperature and the pressure.



Source: ANDREW MCLEISH, *Geological Science*, Blackie (1986)

- (i) What form of the mineral exists at a temperature of 600 °C and a pressure of 2 kb?

.....
(1 mark)

- (ii) What term describes the conversion of andalusite into sillimanite?

.....
(1 mark)

- (iii) What is the likely source of the heat in this process?

.....
(1 mark)

- (iv) Why does pressure increase with depth?

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

There are no questions printed on this page

3 A student investigated the effect of earthworm activity on the soil fertility of farmland. The aim was to see whether liming might encourage earthworms and thus improve infiltration, drainage and organic matter content.

(a) Using samples from two different fields, the following procedure was carried out first.

- Soil samples were taken from each field
- A sub-sample was placed in a boiling tube
- 1 cm³ barium sulphate was added to flocculate clay particles
- 5 cm³ water was added
- Indicator solution was added
- The colour of the solution was compared with a pH indicator chart.

Suggest **three** precautions that the student should have taken to ensure a fair test.

1

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2

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3

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(3 marks)

(b) The student then measured the earthworm population, organic matter content and infiltration rate of samples from each site. The procedure for measuring organic matter involved heating the soil at 105 °C until a constant weight was achieved and then heating the soil in an oven at 250 °C until a constant weight was achieved.

What was the purpose of heating the soil at:

(i) 105 °C

.....

.....

(1 mark)

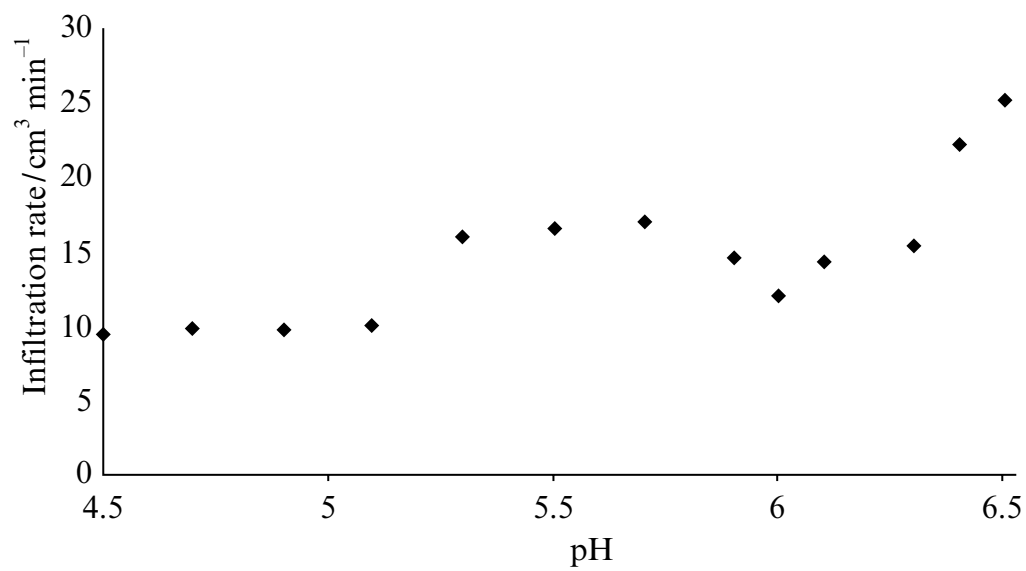
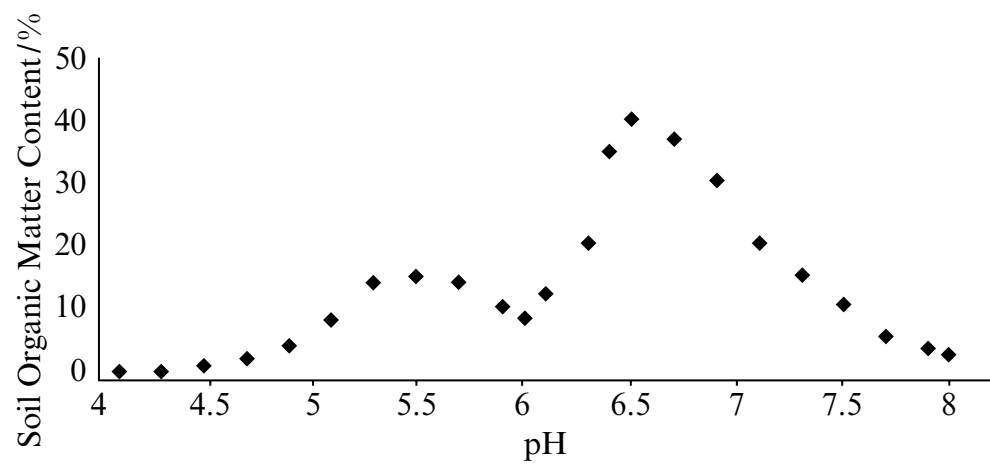
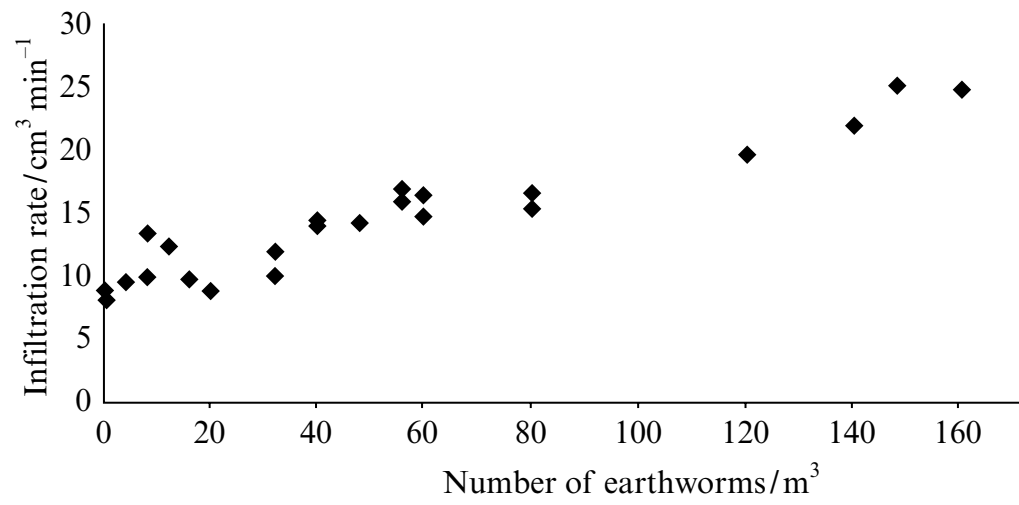
(ii) 250 °C?

.....

.....

(1 mark)

(c) The graphs summarise some of the results.



The student then made three conclusions. Complete the table by putting ticks to indicate whether the conclusions are valid or not valid (invalid).

Conclusion	Valid	Invalid
The most important factor that influences infiltration rate is the number of earthworms		
The highest organic matter content occurs at a neutral pH		
There may be a link between pH and earthworm numbers		

(3 marks)

- (d) Suggest a possible link between soil pH and organic matter content.

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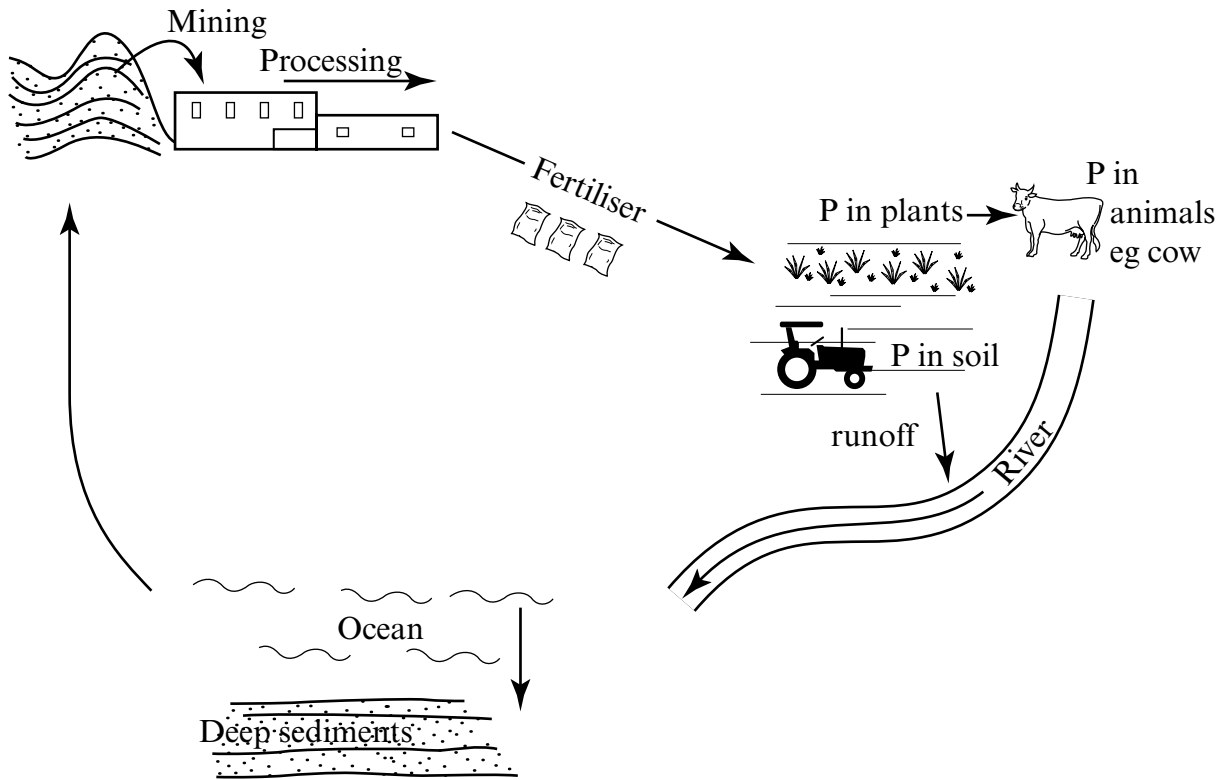
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(2 marks)

Turn over for the next question

4 (a) The diagram shows part of the phosphorus cycle.



(i) State **one** use of phosphorus in living organisms.

.....

 (1 mark)

(ii) Suggest **two** reasons why the cycling of phosphorus is slower than the cycling of carbon or nitrogen.

1

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2

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 (2 marks)

(iii) Suggest **three** ways, not shown in the diagram, by which the amount of phosphorus compounds in the soil may increase.

1

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2

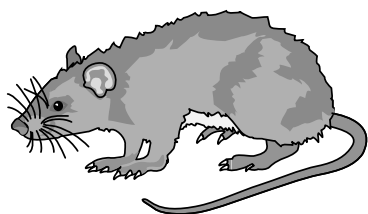
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(3 marks)

(b) Outline how, within a matter of weeks, a nitrogen atom in a rat's tongue may become part of an environmental science student's tongue.



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not to scale

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(4 marks)

5 Crushed limestone from quarries in the Mendip Hills in Somerset is used throughout the south of England.

(a) Outline how the properties of limestone are related to its uses.

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(3 marks)

(b) Suggest why the national demand for limestone is expected to increase dramatically over the next ten years.

.....
.....

(1 mark)

(c) A proposal to open a new quarry in the Mendip Hills was rejected after a Public Inquiry.

Outline the main elements of a Public Inquiry.

.....
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(3 marks)

(d) Outline **three** environmental impacts of a new limestone quarry.

- 1
-
- 2
-
- 3
-

(3 marks)

10

Turn over for the next question

6 The government wants to use more poor quality agricultural land for house building.

(a) Suggest **two** difficulties of using derelict land for house building.

1

2

(2 marks)

(b) The government is facing calls from the construction industry to relax or even to abolish Green Belts.

(i) What is the purpose of the Green Belt designation?

.....

(1 mark)

(ii) Outline **two** problems associated with the Green Belt designation.

1

2

(2 marks)

(c) The best quality agricultural land will normally be used for food production.

Outline the soil properties that are important for soil fertility.

Quality of Written Communication will be assessed in this answer.

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(10 marks)

15

END OF QUESTIONS

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