Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
January 2012

Environmental Studies ENVS2

Unit 2 The Physical Environment

Wednesday 18 January 2012 1.30 pm to 3.00 pm

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

Time allowed
- 1 hour 30 minutes

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. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
  Two of these marks are for the Quality of Written Communication.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.
- Question 9(c) should be answered in continuous prose.
  Quality of Written Communication will be assessed in this answer.

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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

1 The table lists some mineral resources and the first row shows the formation process and a major use of iron oxide.

Complete the table for **each** of the other named mineral resources.

Mineral resource	Formation process	Major use
Iron oxide	Igneous and sedimentary	Building construction
Limestone		
Sand	Sedimentary placer deposit	
Granite		Road surfaces
Halite (sodium chloride salt)		Chlorine for the chemical industry

(5 marks)

5

Turn over for the next question

2 The photograph shows a water meter.

2 (a) Explain how the installation of water meters affects water use.

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(2 marks)

2 (b) Explain how the following may reduce domestic water use.

2 (b) (i) Improved toilet design

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(2 marks)

2 (b) (ii) Grey water use.

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(2 marks)

2 (c) Outline how the conservation of water reduces damage to the environment.

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(4 marks)

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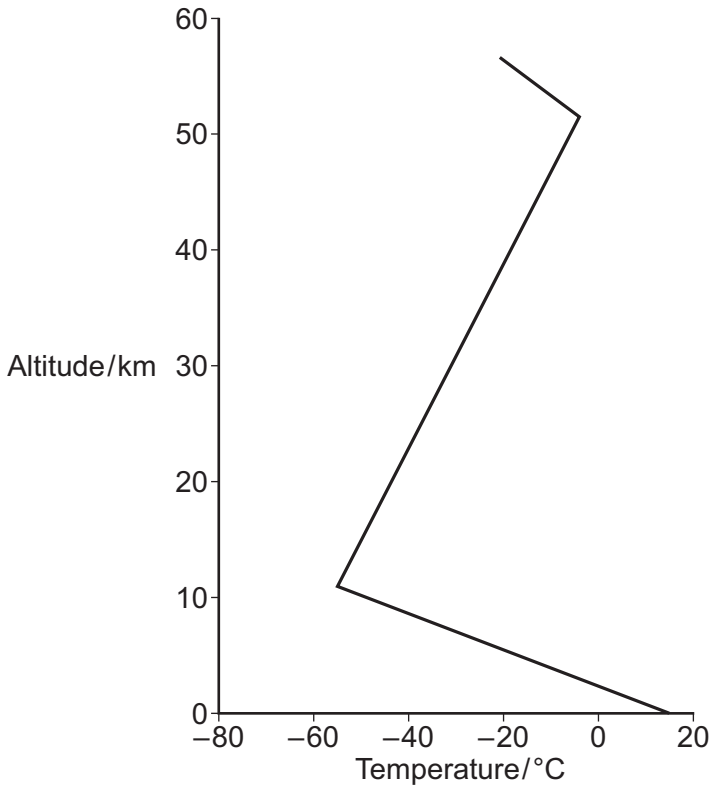
Turn over for the next question

3 The diagram shows the relationship between altitude and temperature in the atmosphere.



3 (a) Explain the change in temperature with increasing altitude in:

3 (a) (i) the troposphere

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(2 marks)

3 (a) (ii) the stratosphere.

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(2 marks)

3 (b) Explain why there is very little water vapour in the stratosphere.

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(1 mark)

3 (c) (i) Outline the natural chemical reactions involving the different forms of oxygen that take place in the stratosphere.

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(2 marks)

3 (c) (ii) Explain how these reactions are affected by human activities.

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(3 marks)

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Turn over for the next question

4 The map shows some areas of Eastern England at risk of flooding if sea level rises.

4 (a) Outline **two** reasons why global climate change may cause sea level to rise.

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(2 marks)

4 (b) Suggest how coastal areas that are high enough to avoid flooding may still be threatened by sea level rise.

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(1 mark)

4 (c) Explain why it may be difficult for species displaced by a rise in sea level to colonise new habitats.

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(3 marks)

4 (d) Explain how a positive feedback mechanism may affect global climate change.

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(4 marks)

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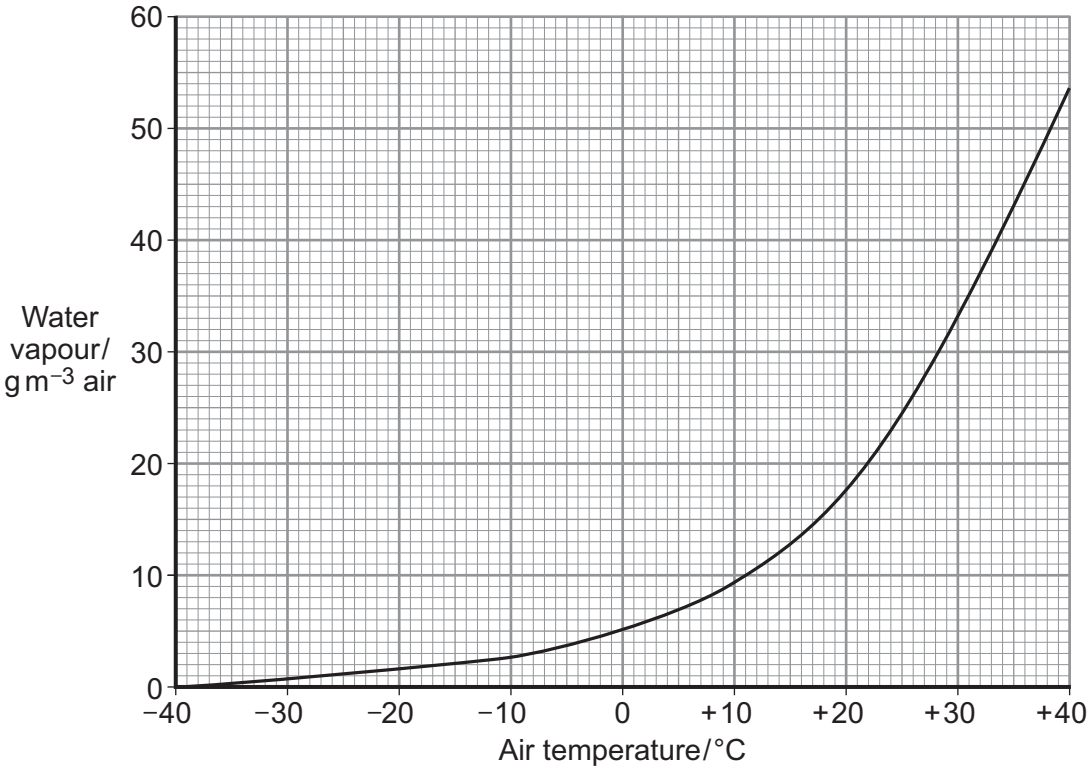
Turn over for the next question

5 The graph shows the relationship between temperature and the moisture-holding capacity of air.



5 (a) Describe the graph.

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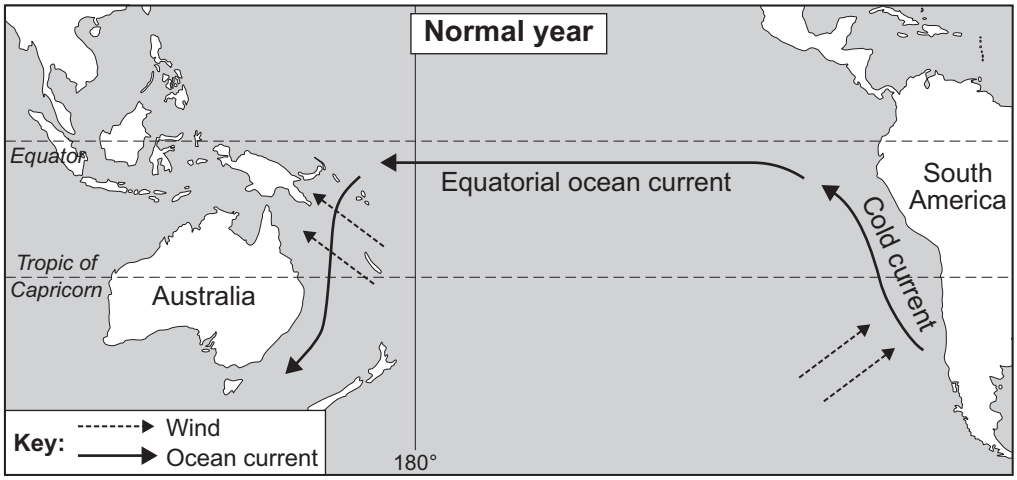
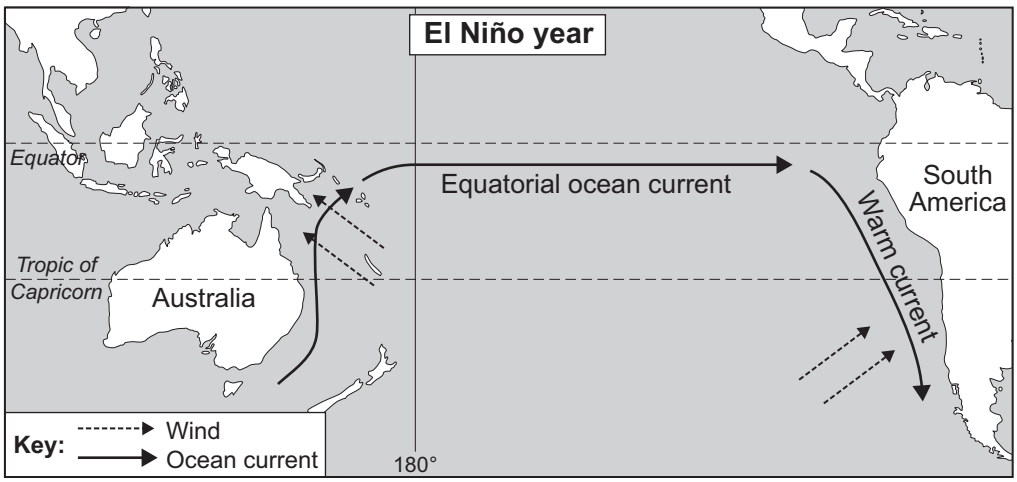
(2 marks)





5 (b) Use the graph and maps to explain why much of the west coast of South America:

5 (b) (i) is normally a desert

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(2 marks)

5 (b) (ii) experiences floods in El Niño years.

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(2 marks)

Turn over ▶

5 (c) Explain why a rise in temperature may cause the velocity of the Gulf Stream (North Atlantic Conveyor) to decrease.

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(4 marks)

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

6 The method used by a student to investigate the impact of fertiliser use on earthworm populations in three different fields is shown below.

Method:

- Vegetation and litter were cleared from a 2 m × 2 m area in the middle of the field.
- A detergent irritant solution was sprayed over the area until the surface layer was saturated.
- More solution was added as necessary to maintain saturation.
- A 0.5 m × 0.5 m quadrat was placed in the middle of the cleared area.
- The collection area was observed for three hours.
- Any earthworms coming to the surface were collected, dried with tissue paper and weighed.

The table summarises the results.

	Study site		
	A	**B**	**C**
Number of earthworms collected	38	67	43
Mean earthworm mass	0.25	0.31	0.35
Standard deviation (SD)	0.05	0.03	0.02
Mean mass ± 1 SD	0.20 – 0.30	0.28 – 0.34	0.33 – 0.37

6 (a) (i) Describe how calculating the standard deviations (SD) of the mean values helps to show whether mean values are significantly different from each other.

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(2 marks)

6 (a) (ii) Do the standard deviations suggest that the following comparisons of mean values show significant differences?

Put a ring around the correct response. The first comparison has been completed.

Study sites **A** and **B** Yes (No)

Study sites **B** and **C** Yes No

Study sites **A** and **C** Yes No *(1 mark)*

6 (b) Suggest how the texture of the soil may have influenced the effectiveness of the method used.

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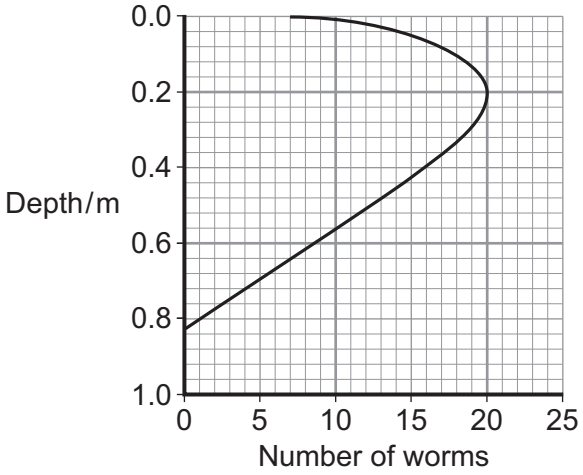
(3 marks)

Question 6 continues on the next page

6 (c) The student extended the study by investigating the earthworm population at different depths. Test pits were dug and the soil from different depths was hand-sorted. The earthworms found were counted.

The graph shows the results.



6 (c) (i) What was the maximum depth at which earthworms were found?

…….m

(1 mark)

6 (c) (ii) At what depth was the greatest number of earthworms found?

……...…….m

(1 mark)

6 (c) (iii) Suggest why the earthworm population varied at different depths.

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(2 marks)

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Turn over for the next question

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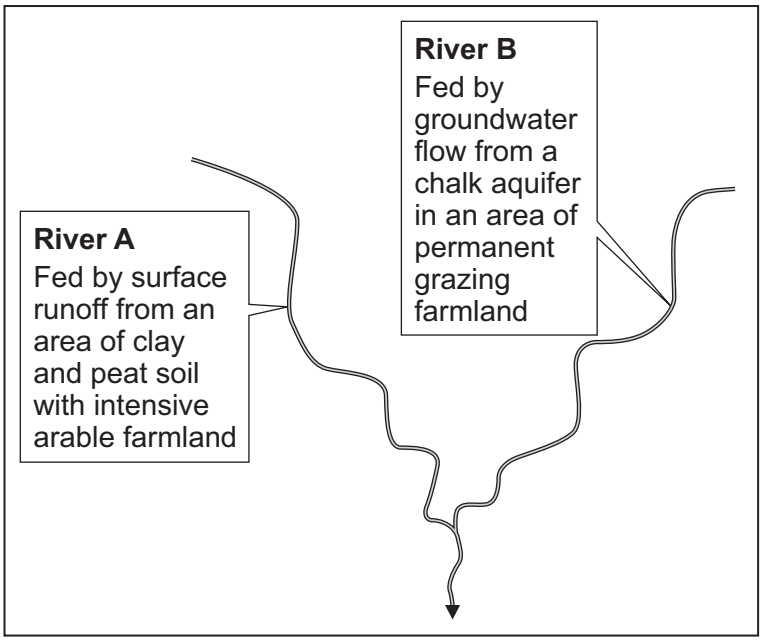
ANSWER IN THE SPACES PROVIDED

7 The map shows an area with two river tributaries. The local water company is planning to abstract water from one of them.



7 (a) (i) Suggest why the water company prefers to use water from **River B** for public water supply.

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(3 marks)

7 (a) (ii) Outline **two** treatment processes that would be more important if water from **River A** was used instead of water from **River B**.

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(4 marks)

7 (b) Explain how the quality of a water source can affect its suitability for **named** industrial uses.

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(3 marks)

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Turn over for the next question

8 A nature reserve manager investigated the impact of trampling by visitors on the abiotic factors of the soil of the reserve and on the organisms found in it.

The manager decided to measure the following:

- numbers of soil detritivores
- soil pH
- water content
- organic matter content
- texture
- oxygen level
- infiltration rate.

The oxygen level was estimated by measuring the amount of oxygen in water draining into a path-side ditch.
The infiltration rate was measured as the length of time it took 25 cm^3 of water to drain into the soil from a plastic tube pushed into the ground.

Data were collected in areas with high, low and no trampling.

8 (a) (i) Describe a method that may be used in the laboratory to extract soil detritivores from a soil sample.

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(3 marks)

8 (a) (ii) Outline **two** limitations of this method.

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(2 marks)

8 (b) The table shows the results.

Soil feature	Sample area		
	High trampling rate	**Low trampling rate**	**No trampling**
Number of soil detritivores / mean number in 50 cm^3 soil	9	13	17
Soil pH	5.0	5.4	5.8
Water content / %	17.5	35.3	25.2
Organic matter content / % dry soil mass	15.0	28.3	17.5
Clay content / % dry soil mass	20	20	20
Silt content / % dry soil mass	35	35	35
Sand content / % dry soil mass	45	45	45
Oxygen level / % saturation	25	45	60
Infiltration rate / seconds for drainage	260	210	125

8 (b) (i) Use the data in the table to suggest **two** reasons for the different numbers of detritivores in the soil samples.

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(2 marks)

8 (b) (ii) Suggest how trampling, oxygen level and organic matter content may be related.

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(3 marks)

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Turn over ▶

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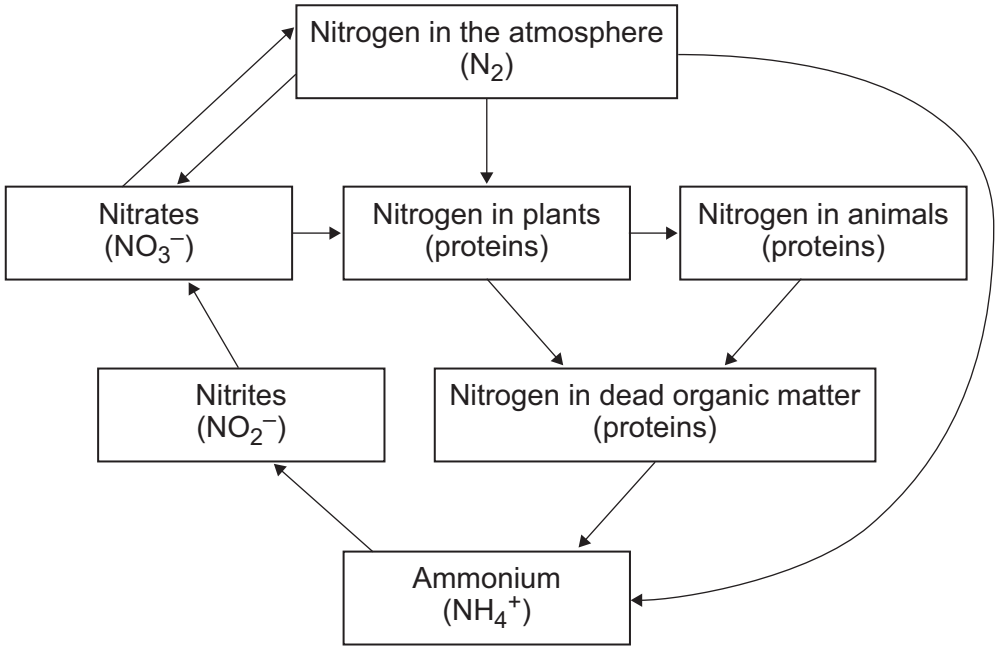

9 (a) Describe the roles of microorganisms in the nitrogen cycle.

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(3 marks)

9 (b) Which is the largest reservoir of:

9 (b) (i) the nitrogen cycle.....

(1 mark)

9 (b) (ii) the phosphorous cycle?.....

(1 mark)

9 (c) Explain how the human control of biogeochemical cycles provides many benefits to humans but also creates environmental problems.

Quality of Written Communication will be assessed in this answer.

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(10 marks)

15

END OF QUESTIONS