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
June 2015

Environmental Studies ENVS2

Unit 2 The Physical Environment

Wednesday 20 May 2015 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(d) should be answered in continuous prose.
  Quality of Written Communication will be assessed in this answer.

A

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 **Table 1** shows the details of some water treatment processes for public supply.

Complete **Table 1**.

[5 marks]

Table 1

Name of treatment process	**Purpose**	**Principle of operation**
Screening	Removal of floating objects such as branches and plastic items	Metal grills trap floating objects
Sedimentation	Removal of suspended solids	
	Collection of pure water	Steam produced by boiling is collected and condensed
Flocculation	Removal of suspended fine clay particles	
Fluoridation	Improvement of dental health	The addition of fluorides
Activated carbon filtration		Contaminants are adsorbed onto carbon granules
Ozonation	Sterilisation / kill microorganisms	Ozone is bubbled into the water
Reverse osmosis	Removal of salt	

5

2 Dynamic equilibria are important features of biogeochemical cycles.

2 (a) Use examples of processes in the nitrogen cycle to explain the meaning of dynamic equilibrium.

[2 marks]

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2 (b) Name a **major** biological use of the following nutrients in living organisms.

2 (b) (i) Nitrogen

[1 mark]

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2 (b) (ii) Phosphorus

[1 mark]

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2 (c) Outline the activities of microorganisms in the nitrogen cycle.

[4 marks]

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2 (d) Explain why draining waterlogged fields results in an increase in soil nitrate levels.

[2 marks]

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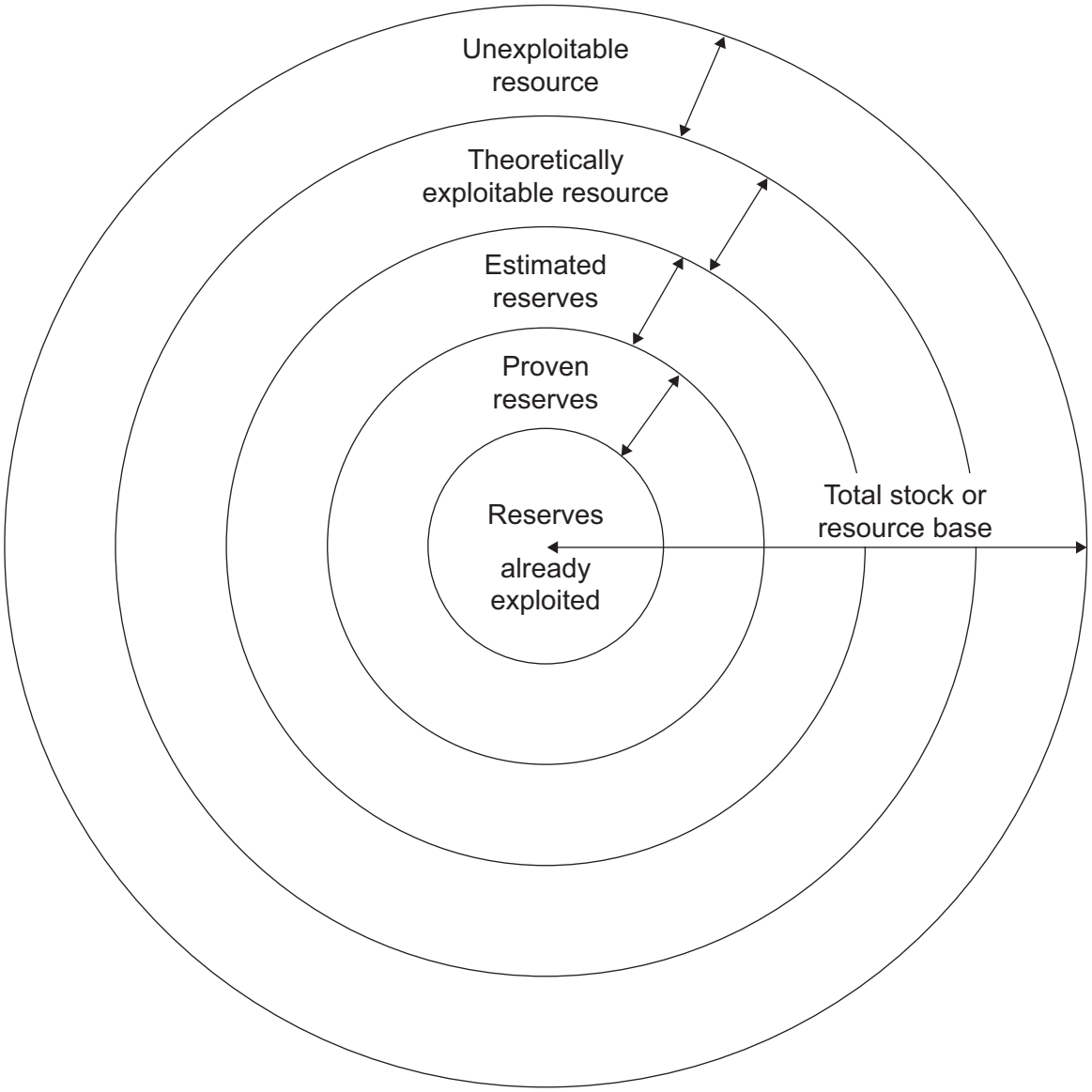
Turn over for the next question

3 **Figure 1** shows the general relationship between different categories of reserves and resources.

Figure 1



3 (a) Explain the effect of the following on the quantity of a metal that can be extracted economically.

3 (a) (i) The development of new methods of exploiting low-grade ores.

[2 marks]

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3 (a) (ii) An increase in the market price of the purified metal.

[2 marks]

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3 (a) (iii) An increase in the cut-off ore grade.

[2 marks]

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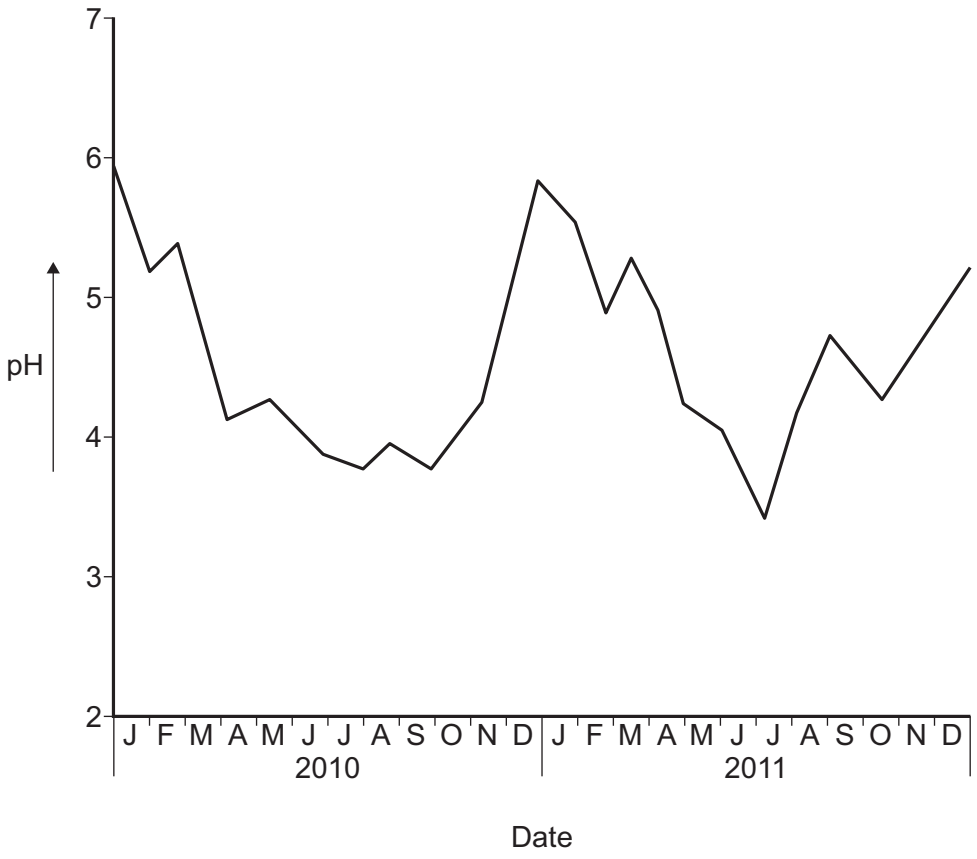
Question 3 continues on the next page

3 (b) **Figure 2** shows the pH of a river which receives the acidic drainage water from a metal mine.

Figure 2



3 (b) (i) Explain how the timing of sampling may have been standardised to collect representative data.

[2 marks]

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3 (b) (ii) Suggest **two** reasons to explain the fluctuations in the pH of the river water.

[2 marks]

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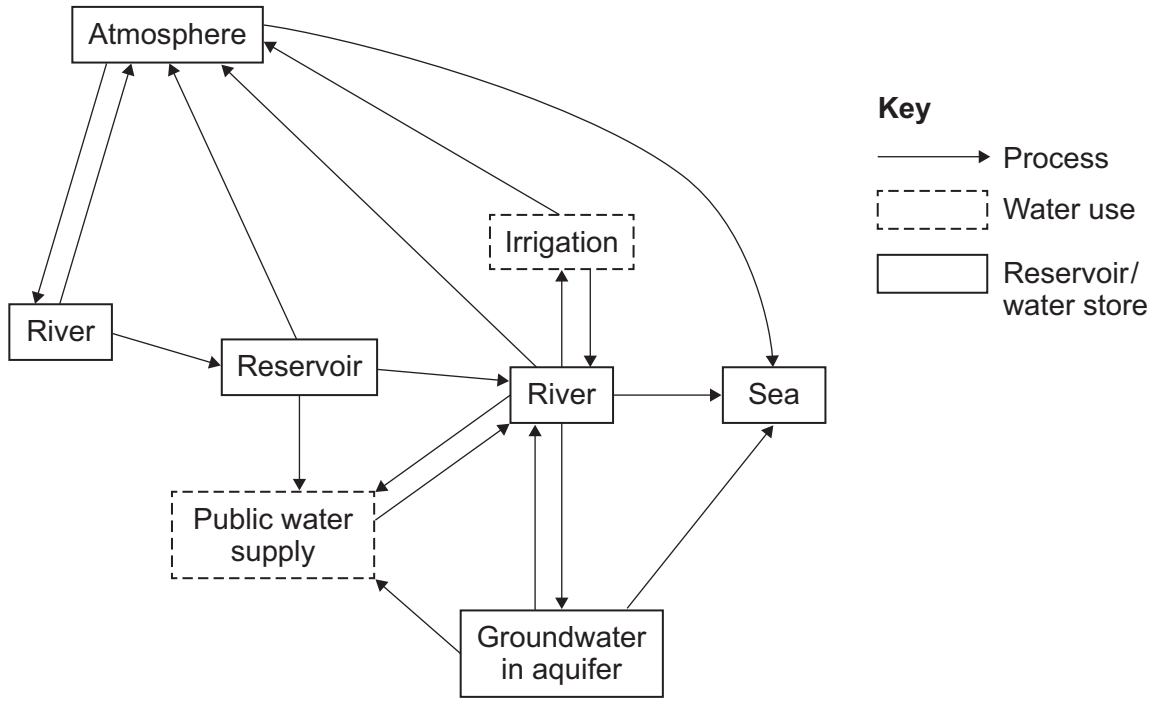
Turn over for the next question

4 **Figure 3** shows processes, reservoirs and movements of water in a river system.

Figure 3



Use information from **Figure 3** and your own knowledge to answer the following questions.

4 (a) Outline the difference between abstractive and non-abstractive uses of water.

[2 marks]

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4 (b) The reservoir that provides water for public supply was created by the construction of a dam.

Suggest why the presence of the dam has affected:

4 (b) (i) wildlife in the river

[1 mark]

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4 (b) (ii) the turbidity of the river water downstream of the dam.

[1 mark]

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4 (c) Suggest how bedrock permeability affects the choice of a reservoir site.

[1 mark]

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4 (d) Outline the advantages **and** disadvantages of providing water for public supply from aquifers rather than from rivers.

[5 marks]

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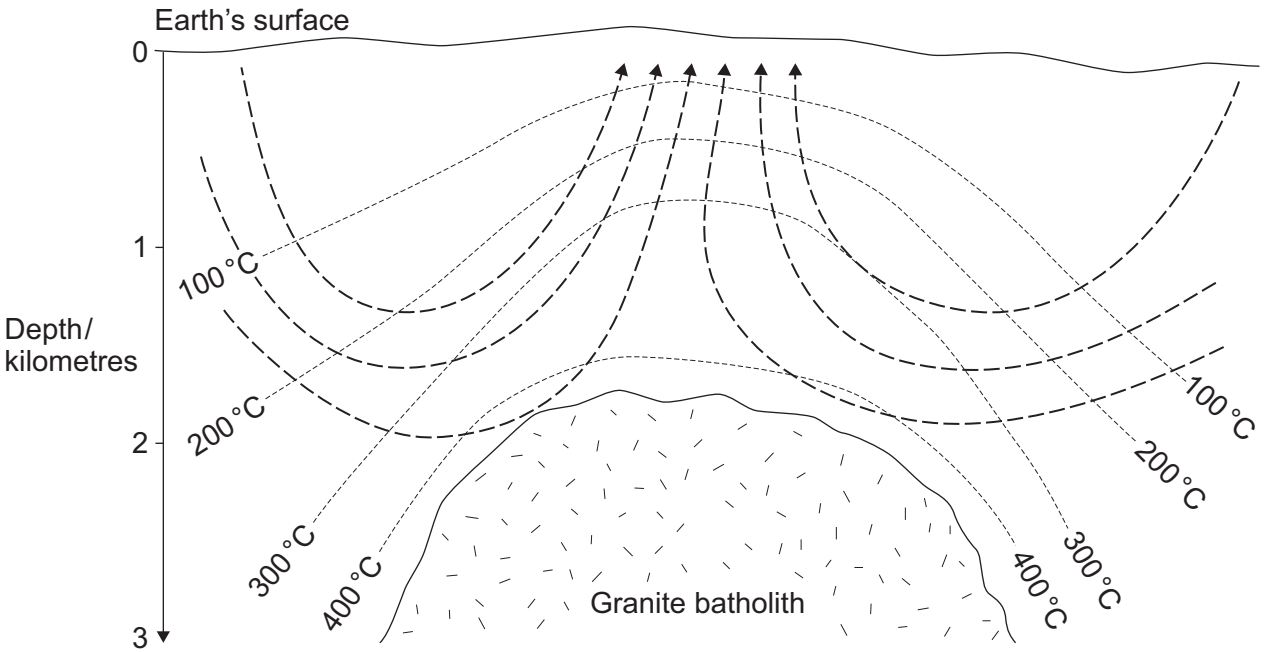
5 **Figure 4** shows some features associated with a granite batholith.

Figure 4



Key

Granite

Isoline of temperature

Flow of water and mineral solutions

Horizontal axis not to scale

5 (a) Describe how hydrothermal processes produce economically recoverable metal ore deposits.

[3 marks]

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5 (b) Outline the processes involved in the formation of slate.

[2 marks]

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5 (c) The mineral composition of a soil affects its texture.

Describe **one** quantitative method that may be used to analyse the texture of a soil sample.

[3 marks]

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5 (d) Describe how soil texture can affect soil properties.

[2 marks]

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6 (a) Explain why the following properties of water are important for living organisms.

6 (a) (i) Change in state between solid, liquid and gas

[2 marks]

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6 (a) (ii) High heat capacity

[2 marks]

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6 (a) (iii) Anomalous expansion when cooling

[2 marks]

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6 (b) Explain how the ocean current, the **North Atlantic Conveyor**, may be affected by rising atmospheric temperatures.

[4 marks]

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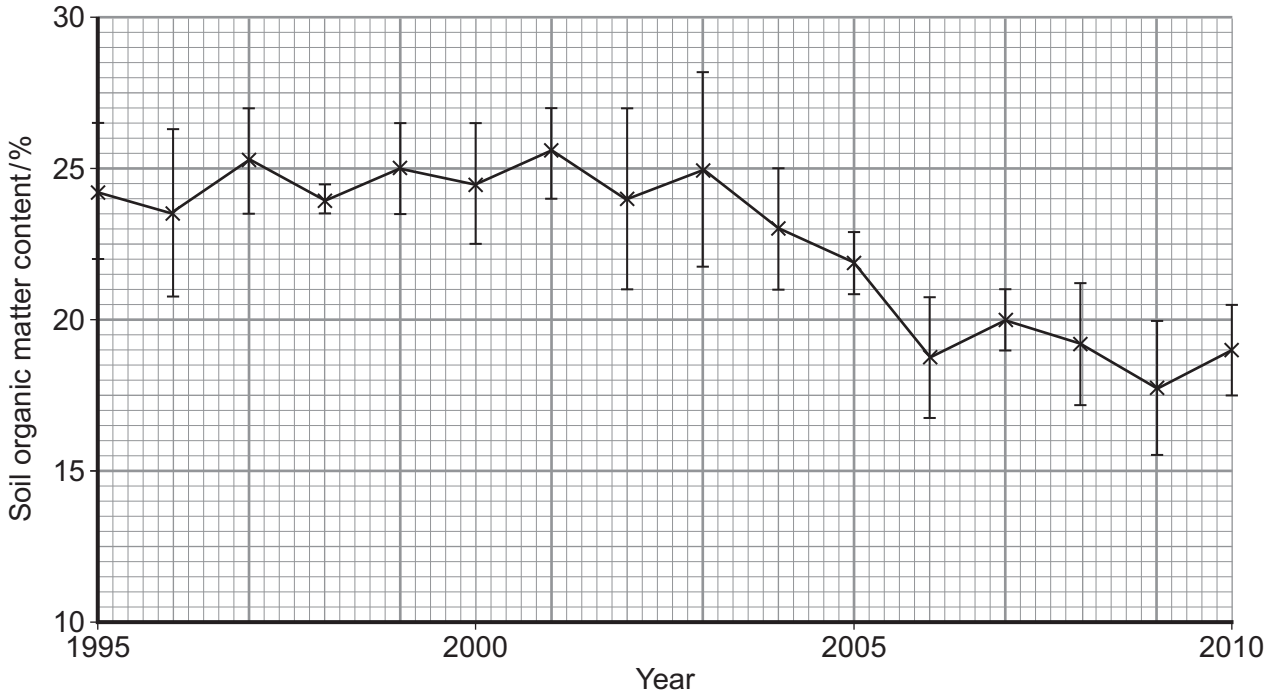
Turn over for the next question

7 **Figure 5** shows the organic matter content of the soil in a field over a 15-year period.

Figure 5



Key

Mean value → ×} ±1 standard deviation (from mean)

7 (a) In which year were the values of soil organic matter most closely scattered around the mean?

[1 mark]

Tick (✓) **one** box.

1996 ☐

1998 ☐

2003 ☐

2007 ☐

7 (b) Suggest how a preliminary study may be used to find the minimum size of each soil sample that would produce reliable results.

[2 marks]

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7 (c) Outline **one** way in which the organic matter content of soil affects its fertility.

[1 mark]

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7 (d) Outline **one** laboratory method that may be used to measure the organic matter content of a soil.

[6 marks]

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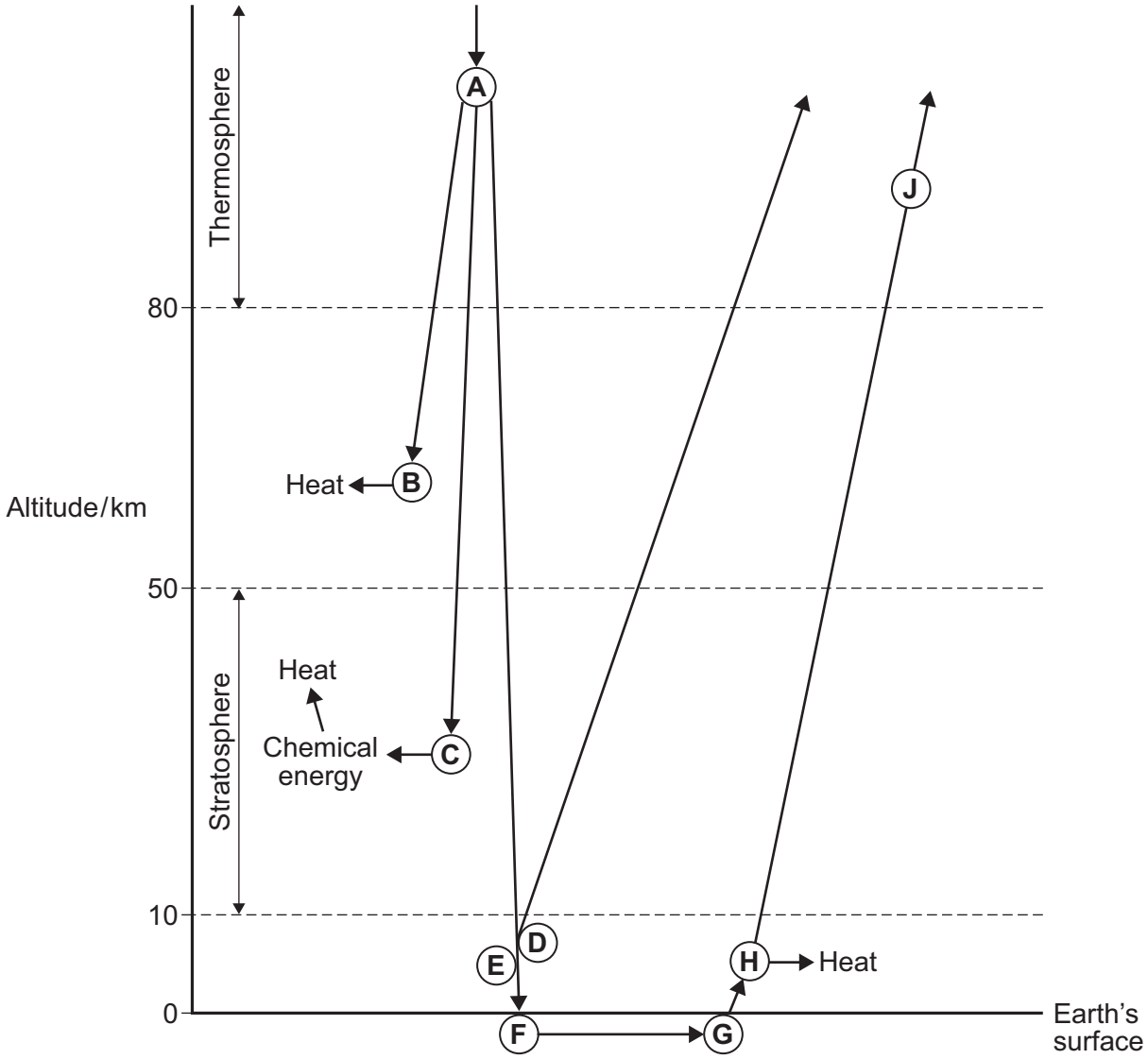
8 **Figure 6** shows some features of energy processes in the atmosphere.

Figure 6



8 (a) Complete **Table 2** by selecting letters from **Figure 6** that best match the description.

[5 marks]

Table 2

Description	**Letter from Figure 6**
Absorption by CO_2	
Absorption of UV light by ozone	
Conversion of visible light to heat	
Emission of infra red	
Reflection of visible light by clouds	

8 (b) Explain why it is difficult to monitor changes in the atmosphere caused by human activities.

[5 marks]

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9 **Figure 7** and **Figure 8** show carbon dioxide concentrations and changes in atmospheric temperature during the last 450 000 years.

Figure 7

Carbon dioxide concentration

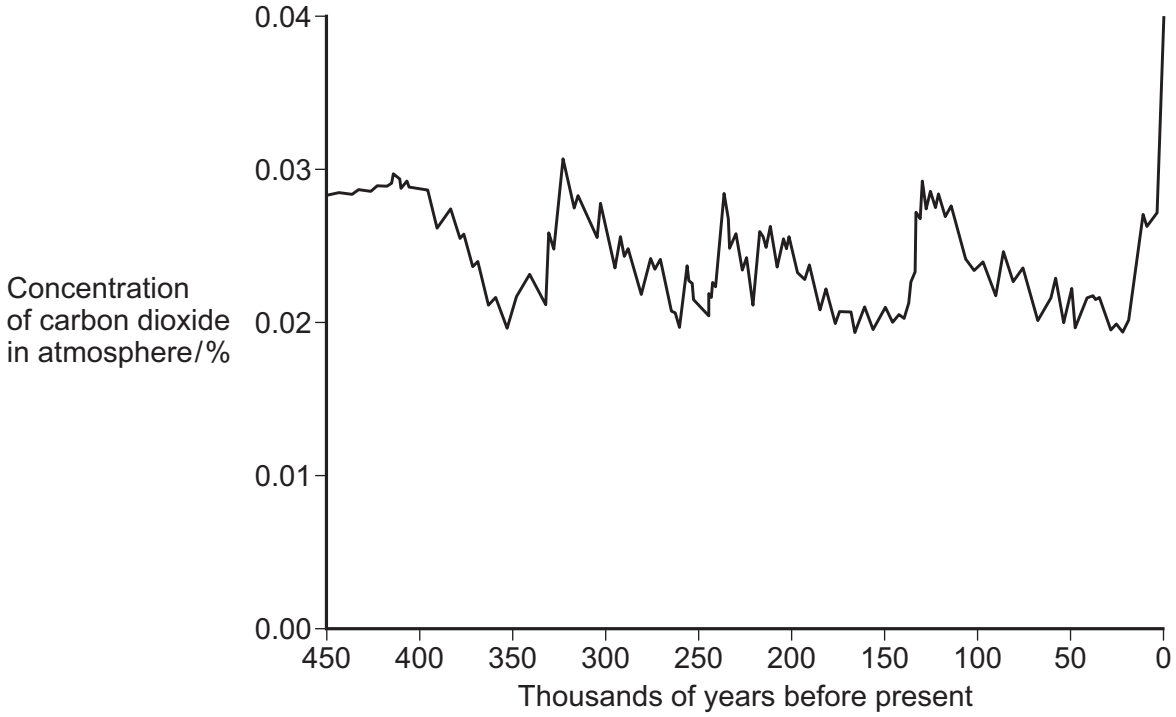
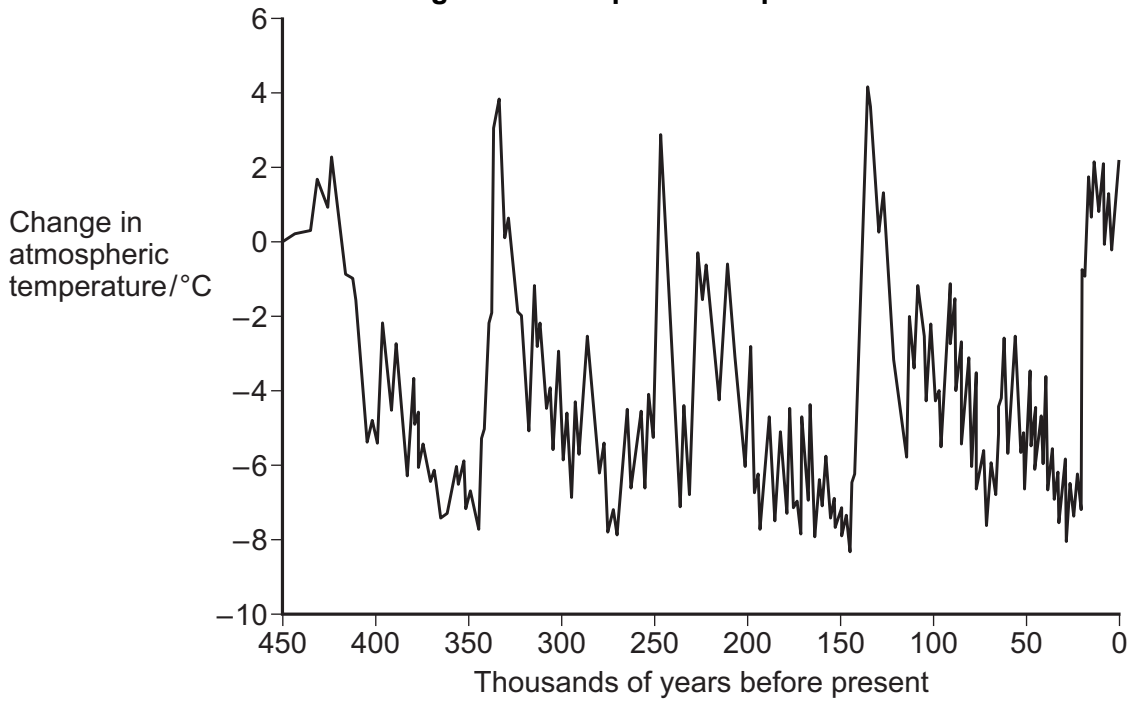


Figure 8

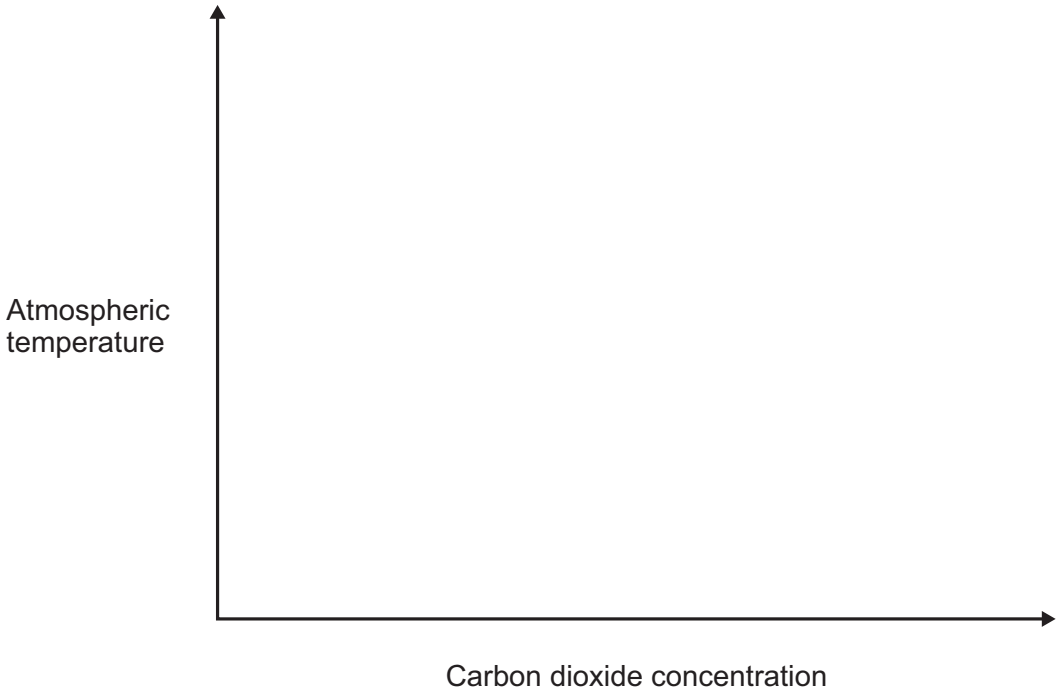
Changes in atmospheric temperature



9 (a) Using information from **Figure 7** and **Figure 8**, draw a line on **Figure 9** to show the general relationship between carbon dioxide concentration and atmospheric temperature.

[1 mark]

Figure 9



9 (b) The link between carbon dioxide concentration and atmospheric temperature is complex, involving many processes and feedback mechanisms.

9 (b) (i) Explain why an increase in carbon dioxide concentration can cause the temperature of the atmosphere to change.

[1 mark]

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9 (b) (ii) Explain why an increase in the temperature of the atmosphere can cause the carbon dioxide concentration to change.

[1 mark]

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9 (c) Outline the different roles that chlorofluorocarbons (CFCs) play in:

9 (c) (i) global climate change

[1 mark]

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9 (c) (ii) ozone depletion.

[1 mark]

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9 (d) Describe the methods that may be used to reduce atmospheric concentrations of greenhouse gases.

You should answer this question in continuous prose.
Quality of Written Communication will be assessed in this answer.

[10 marks]

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Extra space for question 9(d) .....

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END OF QUESTIONS