

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use
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General Certificate of Secondary Education  
June 2007

**ENVIRONMENTAL SCIENCE**  
**Written Paper**  
**Foundation Tier**

**3441/F**  
**F**



Wednesday 20 June 2007 9.00 am to 11.00 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>a ruler.</li> </ul> <p>You may use a calculator.</p>
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Time allowed: 2 hours

**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.

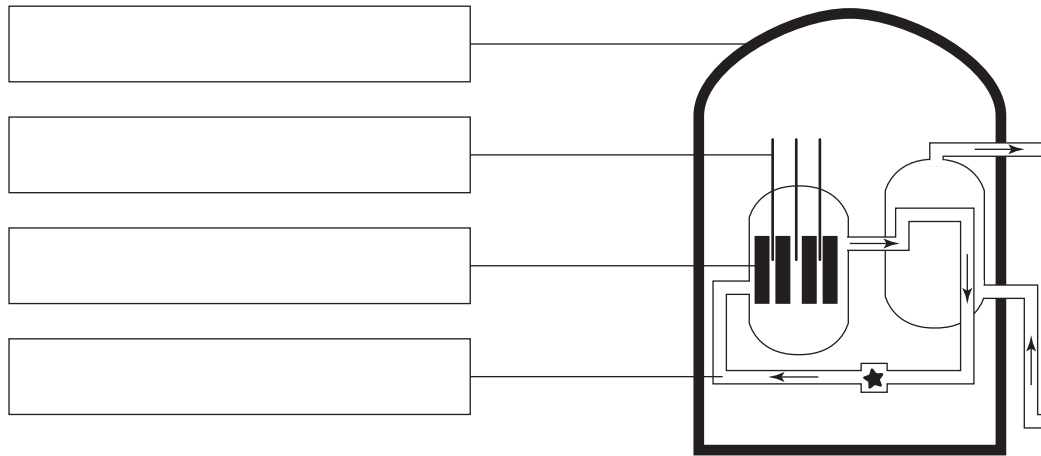
**Information**

- The maximum mark for this paper is 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 5(c) and 6(b)(iii) 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 diagram shows a nuclear reactor.



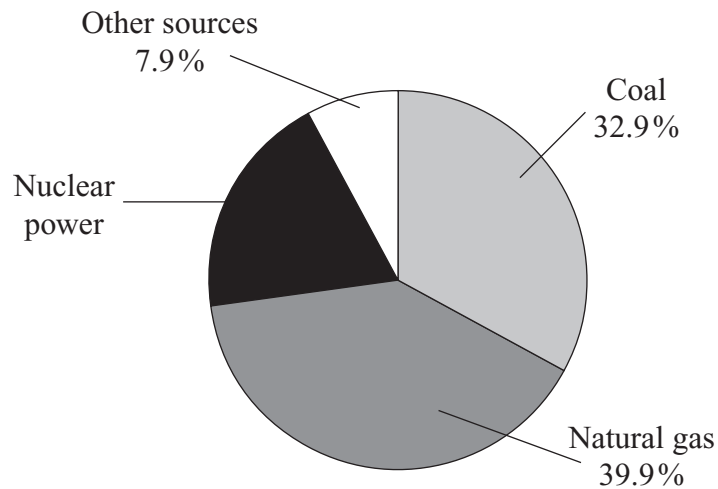
**containment   control rod   coolant   fuel rod   turbine**

- (i) Choose the correct words from the box to label the diagram.  
Write your answers in the spaces provided.
- (ii) Why are nuclear power stations usually built by the sea or next to large rivers?  
Tick the box next to the statement which gives the best reason.

- so that they can get rid of their waste easily
- so that they can obtain large amounts of cooling water
- so that it is easy to transport things to and from them

(1 mark)

- (b) The chart shows the sources of energy used to generate electricity in the United Kingdom in 2004.



- (i) Calculate the percentage of electricity generated using nuclear power.

.....%

(1 mark)

- (ii) Suggest **one** source of energy which could be used to generate the electricity which comes from *other sources*.

.....  
(1 mark)

**Question 1 continues on the next page**

**Turn over ►**

(c) Most of the nuclear reactors in the United Kingdom will probably be closed down during the next ten years.

(i) Some people think that we should build new nuclear reactors to replace the ones which will be closed. The paragraph below explains one reason why they think this.

Choose the correct words from the box to complete the paragraph.

<b>carbon dioxide</b>	<b>fossil fuels</b>	<b>greenhouse effect</b>	<b>hydrogen</b>
<b>long wavelength</b>	<b>ozone layer</b>	<b>renewable resources</b>	<b>ultra violet</b>

Coal and natural gas are both ..... . When they are burnt ..... is given off. This gas absorbs ..... radiation in the atmosphere, which adds to the ..... . This could cause harmful changes in the Earth's climate. Nuclear reactors do not give off this gas.

(4 marks)

(ii) State **two** reasons why some people think that we should not build any new nuclear reactors.

1.....  
.....

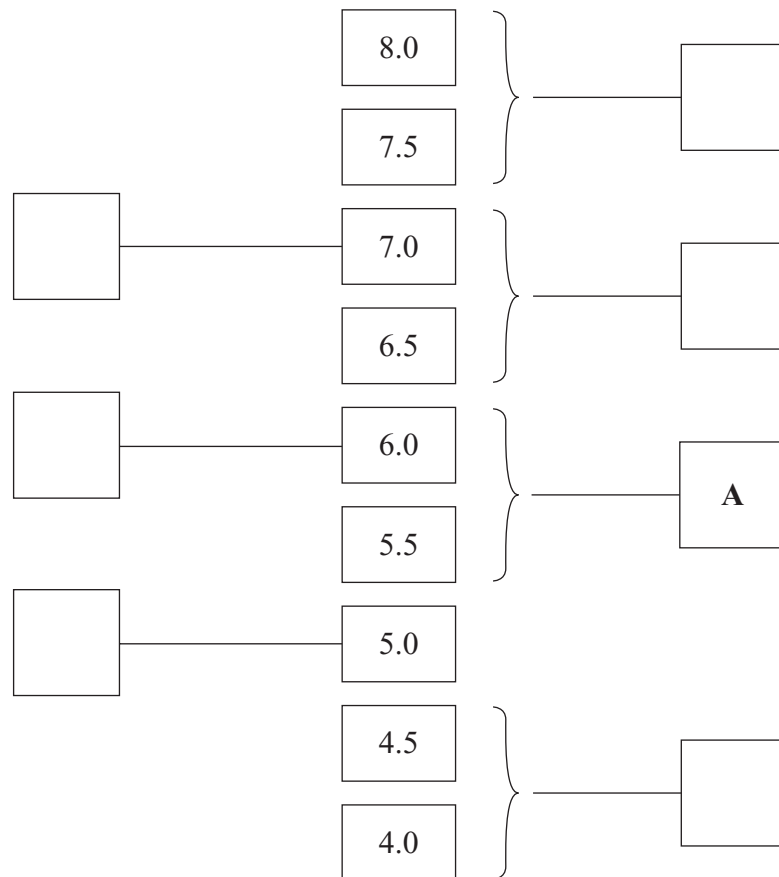
2.....  
.....

(2 marks)

**Turn over for the next question**

**Turn over ►**

- 2 (a) The pH of soils in the United Kingdom is usually between 4.0 and 8.0. The chart shows this part of the pH scale.



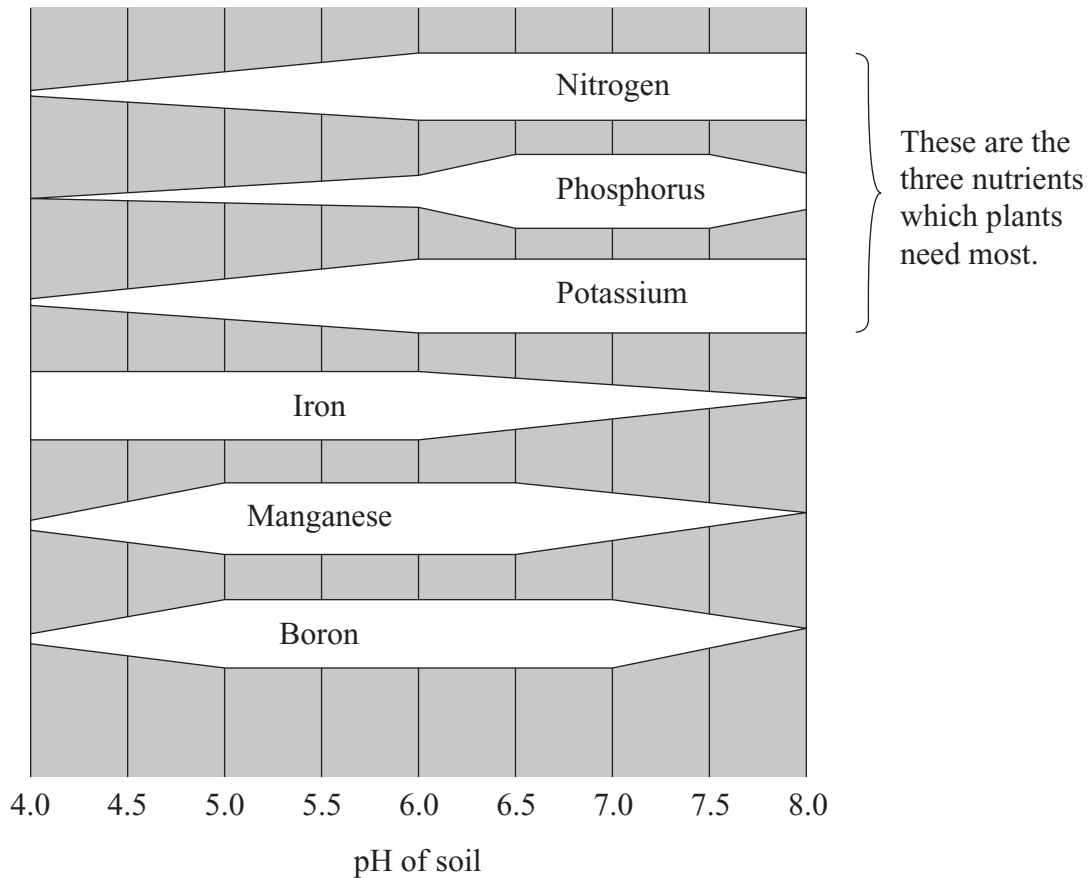
The following statements each have a letter.

Write each letter, **B**, **C** and **D**, in its correct box on the chart. Letter **A** has been done for you.

- A** The best pH for growing potatoes is between 5.5 and 6.0.
- B** Neutral on the pH scale.
- C** The clematis is a climbing plant which grows well in alkaline soils.
- D** Rhododendrons grow well in the most acidic soils.

(3 marks)

- (b) The diagram shows how pH affects the amount of nutrients which plants can get from the soil. The thicker the bar the more of the nutrient can be used by plants.



- (i) Name **one** nutrient which starts to become more difficult for plants to get from the soil when the pH falls below 6.0.

.....  
(1 mark)

- (ii) Name **one** nutrient which is easiest for plants to get from the soil when the pH is 4.5.

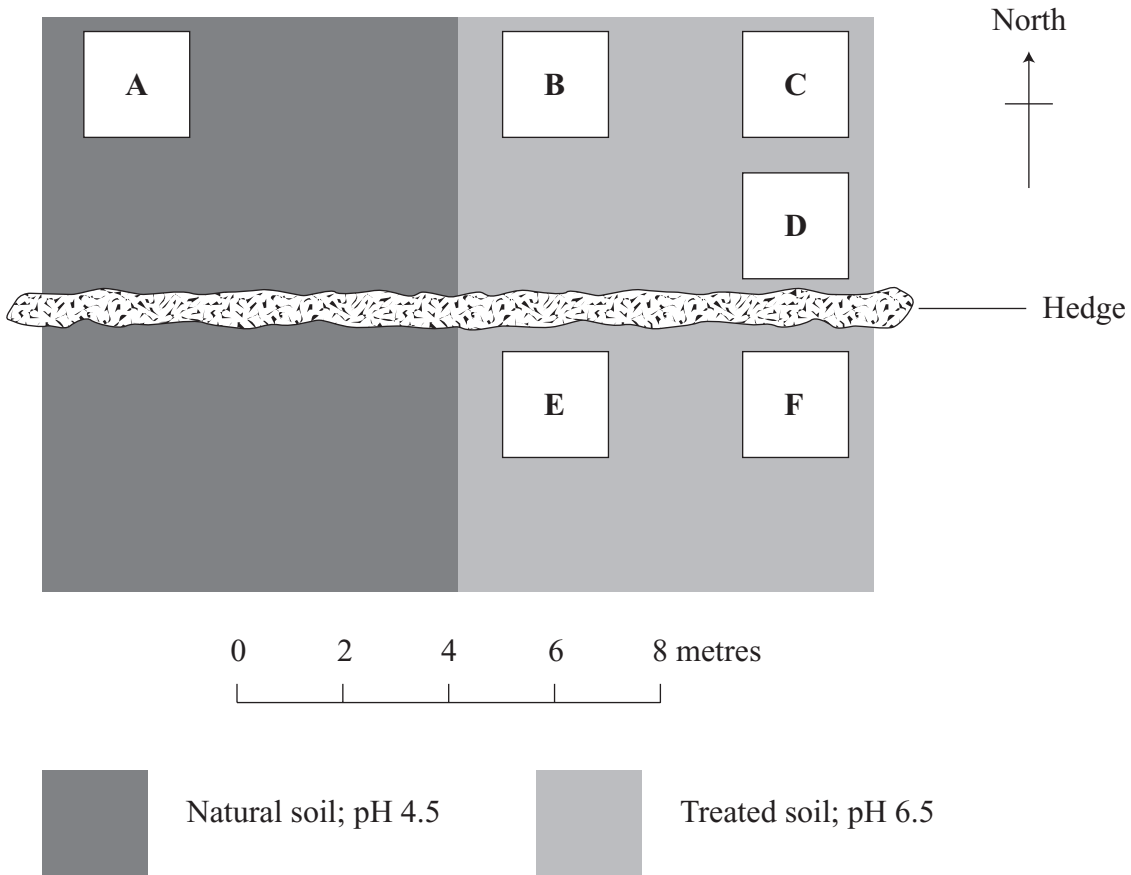
.....  
(1 mark)

- (iii) A soil pH of 6.5 is best for many plants.  
Use information from the diagram to help you to explain this.

.....  
.....  
.....  
.....  
(2 marks)

Turn over ►

- (c) A group of students investigated how the pH of soil affected the yield of crops of wheat. The plan shows the area where they did their investigation. They planted wheat seeds in two of the small plots labelled **A** to **F**.



- (i) Calculate the area of Plot **A**.

.....square metres.

*(1 mark)*

- (ii) The students treated half the area with a substance to change the pH from 4.5 to 6.5.

Name a substance which they could have used.

.....

*(1 mark)*

- (iii) Suggest a hypothesis which the students could have tested in this investigation.

.....  
.....

*(1 mark)*



- (iv) The students were told to plant seeds in Plot **A** and in one other plot. They wanted to make sure that they did a fair test. Which **one** of the plots labelled **B** to **F** would be the best one to use?

Plot .....

(1 mark)

- (v) Explain **one** reason for your choice in part (iv).

.....  
.....  
.....  
.....

(2 marks)

- (vi) State **two** other things which the students could have done to help to make the investigation a fair test.

1.....  
.....

2.....  
.....

(2 marks)

15
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**Turn over for the next question**

**Turn over ►**

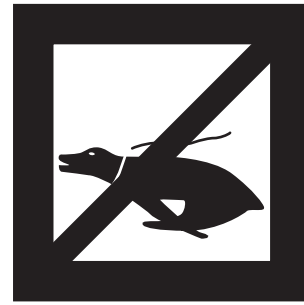
- 3 (a) The signs are from a National Park in Slovenia. They tell visitors about activities which are not allowed in the National Park.



A



B



C



D



E



F

Complete the table by writing the letters of **four** of the signs in the spaces provided.

An activity which could harm the appearance of the landscape.	
An activity which could harm biodiversity.	
An activity which could cause water pollution.	
An activity which could frighten or disturb other visitors.	

(4 marks)

- (b) The photographs show parts of a ski resort in the same National Park in Slovenia. The pictures were taken in summer, but in winter the whole area is covered by snow.



(i) Explain **two** reasons why some people are against the development of ski resorts in areas such as National Parks. Use evidence from the photographs to help you.

1.....  
.....  
.....  
.....

2.....  
.....  
.....  
.....

*(4 marks)*

(ii) State **two** reasons why some people may be in favour of the development of ski resorts in these areas.

1.....  
.....  
2.....  
.....

*(2 marks)*

(c) (i) Name **one** National Park in the United Kingdom.

.....  
*(1 mark)*

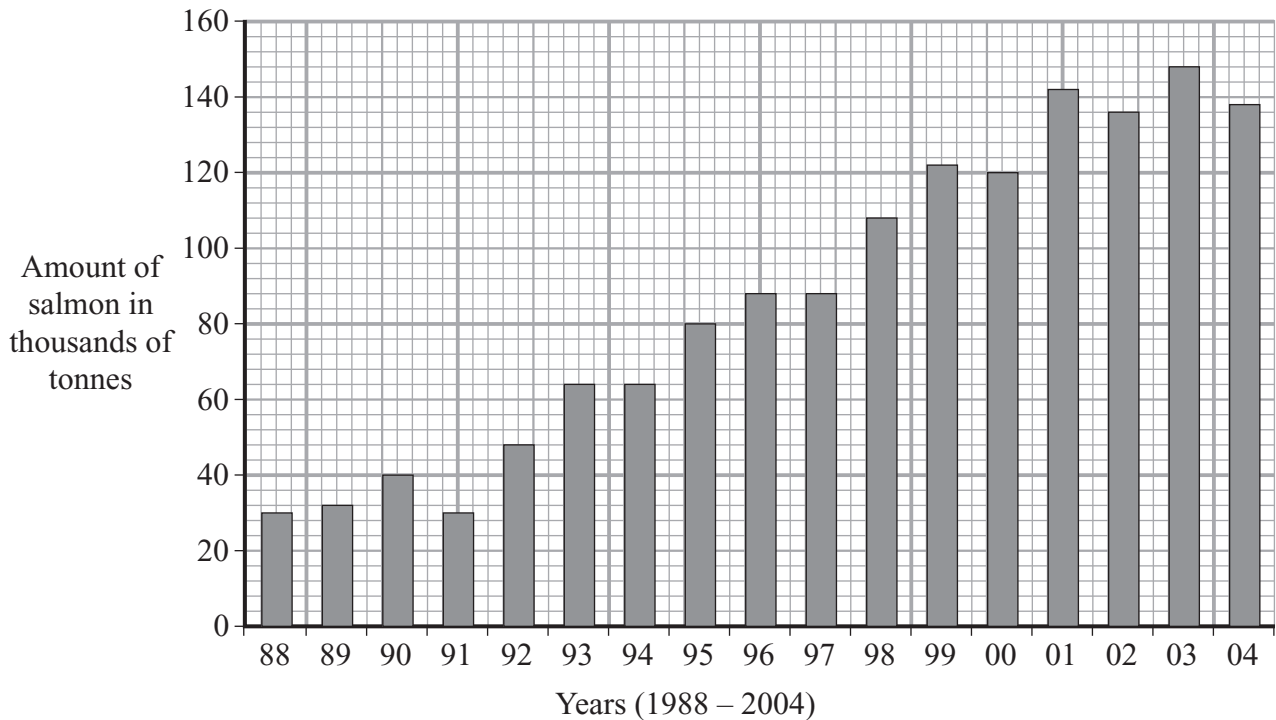
(ii) What is the main purpose of the National Parks in the United Kingdom?

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

**Turn over for the next question**

**Turn over ►**

- 4 (a) The chart shows the amount of salmon produced on fish farms in Scotland from 1988 to 2004.



Source: These statistics were made available by The Crown Estate [www.thecrownestate.co.uk](http://www.thecrownestate.co.uk)

- (i) What does the chart show about the change in the amount of salmon produced between 1988 and 2004?

.....

.....

.....

.....

(2 marks)

- (ii) In which year did salmon production reach 100 000 tonnes for the first time?

.....

(1 mark)

- (iii) A student used the chart to estimate the amount of salmon produced in 2005. His estimate was 100 000 tonnes. Tick the correct box to show whether you think this was a sensible estimate or not. State **one** reason for your answer.

100 000 tonnes is a sensible estimate for salmon production in 2005.

100 000 tonnes is not a sensible estimate for salmon production in 2005.

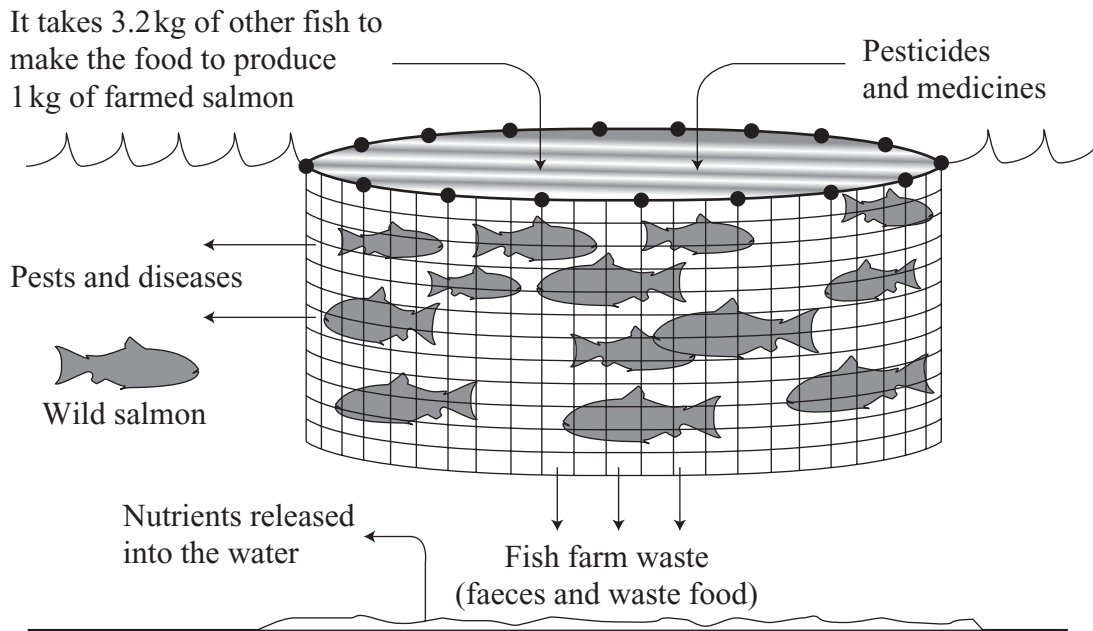
Reason .....

.....

.....

(2 marks)

(b) The diagram shows one of the underwater cages on a fish farm.



(i) In 2004, the total amount of salmon produced by fish farms in Scotland was 138 000 tonnes.  
Calculate the weight of other fish needed to provide food for this amount of farmed salmon.

.....tonnes

(1 mark)

(ii) Some people are worried that salmon farming can harm wild salmon.  
Suggest **one** reason why this may happen.

.....  
.....

(1 mark)

(iii) Fish farms can cause an increase in harmful algae (microscopic plants) in the water nearby.  
Explain **one** reason why this may happen.

.....  
.....  
.....

(2 marks)

Turn over ►

(c) The box gives some information about the sea fishing industry in the European Union.

- The sea fishing industry in the European Union is controlled by the Common Fisheries Policy (the CFP).
- The main aim of the CFP is to stop overfishing.

(i) Explain what is meant by *overfishing*.

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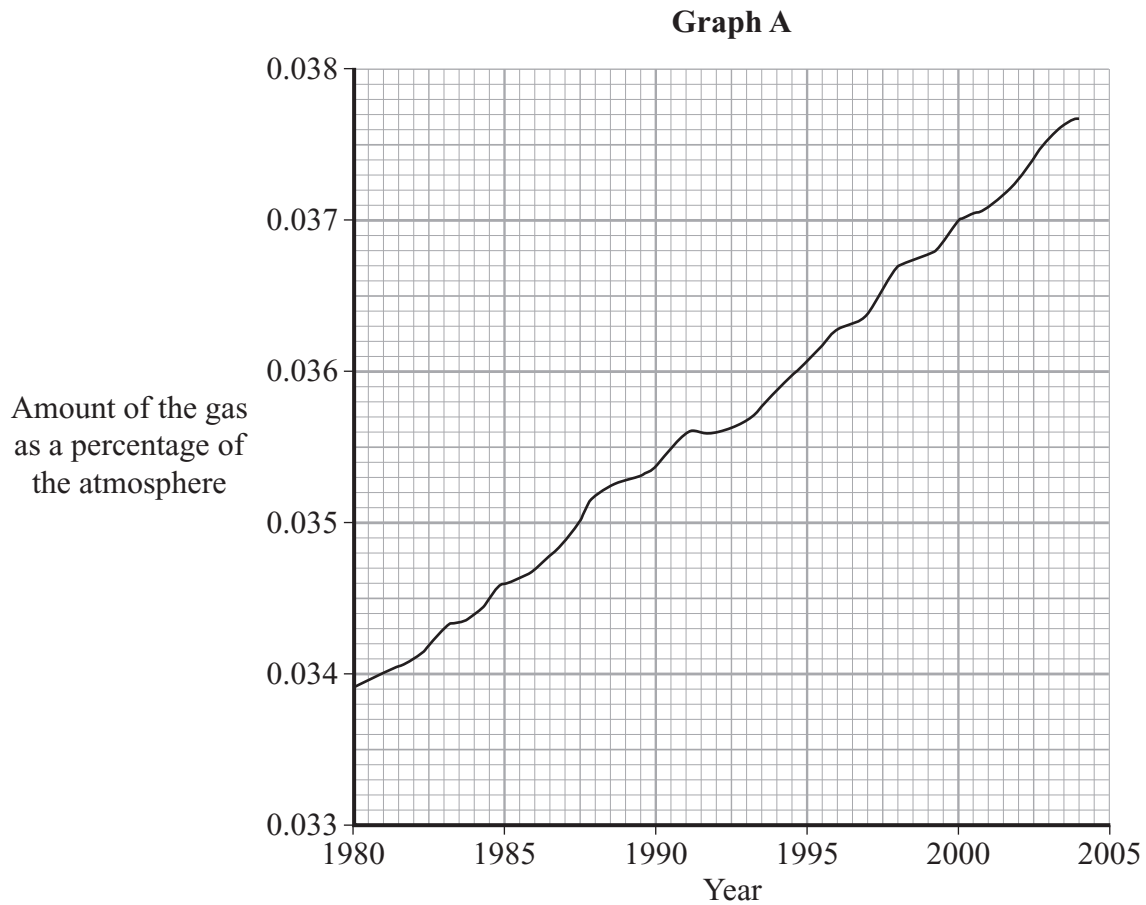
(2 marks)

(ii) Explain **one** method which can be used to help to conserve stocks of fish.

.....  
.....  
.....  
.....

(2 marks)

- 5 (a) **Graph A** shows the change in the amount of one of the gases in the Earth's atmosphere between 1980 and 2004.



- (i) **Graph A** refers to one of the following gases. Which one?  
Tick the correct box.

- Carbon dioxide
- Nitrogen
- Oxygen

(1 mark)

- (ii) State **one** reason for your choice in part (i).

.....

.....

(1 mark)

- (iii) State **one** reason for the pattern of change shown by **Graph A**.

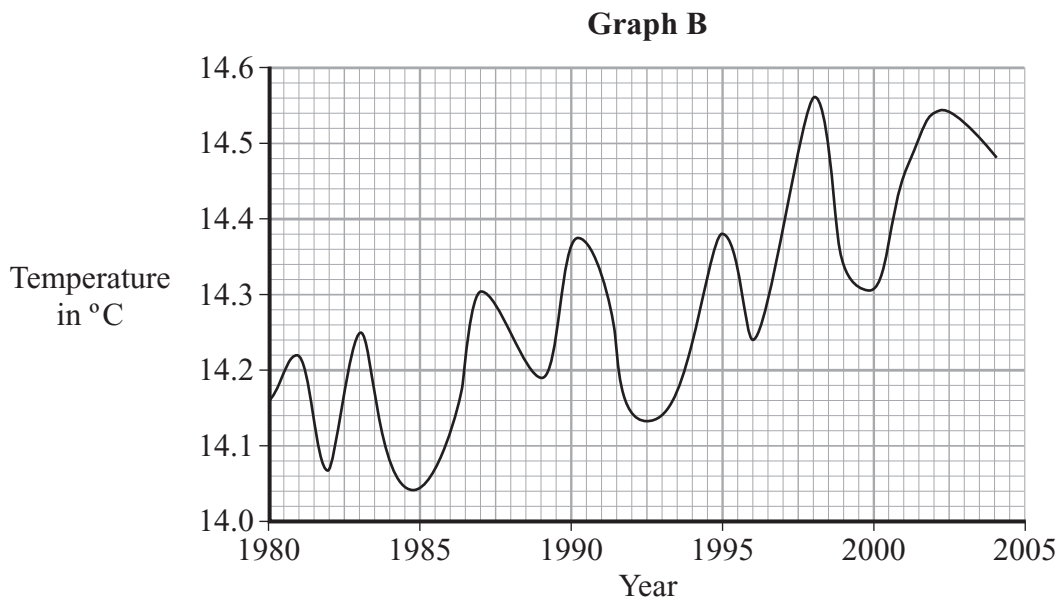
.....

.....

(1 mark)

**Turn over ►**

- (b) **Graph B** shows the changes in the average temperature of the Earth's surface between 1980 and 2005.



- (i) In which year did the Earth's average temperature first reach 14.3°C?  
 .....  
 (1 mark)
- (ii) Draw a straight line on **Graph B** to show the overall trend in the Earth's average temperature between 1980 and 2004.  
 (1 mark)
- (iii) Many people think that the Earth's temperature is changing because of air pollution. What does **Graph B** show about this idea?  
 Tick **one** box to show the best answer.
- The graph shows that the Earth's temperature is definitely increasing because of air pollution.
- The graph shows that the Earth's temperature is increasing but gives no information about the cause.
- The graph shows that the Earth's temperature is definitely not increasing because of air pollution.
- (1 mark)



(iv) Explain **one** reason for your choice in part (iii).

.....  
.....  
.....  
.....

(2 marks)

(c) Many people live in areas close to the sea. Explain **two** ways in which an increase in the Greenhouse Effect could cause problems for these people.

*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.*

1 .....

.....  
.....  
.....

2 .....

.....  
.....  
.....

(5 marks)

13

**Turn over for the next question**

**Turn over ►**

6 (a) The diagram shows processes used in the treatment of drinking water.

Process	Definition
Screening	Large objects are removed from the water
Sedimentation	Water is held in tanks where small particles sink to the bottom
Process A	Water is passed through sand or charcoal to remove the smallest particles
Process B	Harmful bacteria, viruses and other organisms are killed

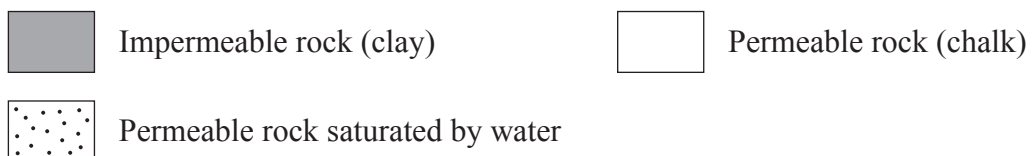
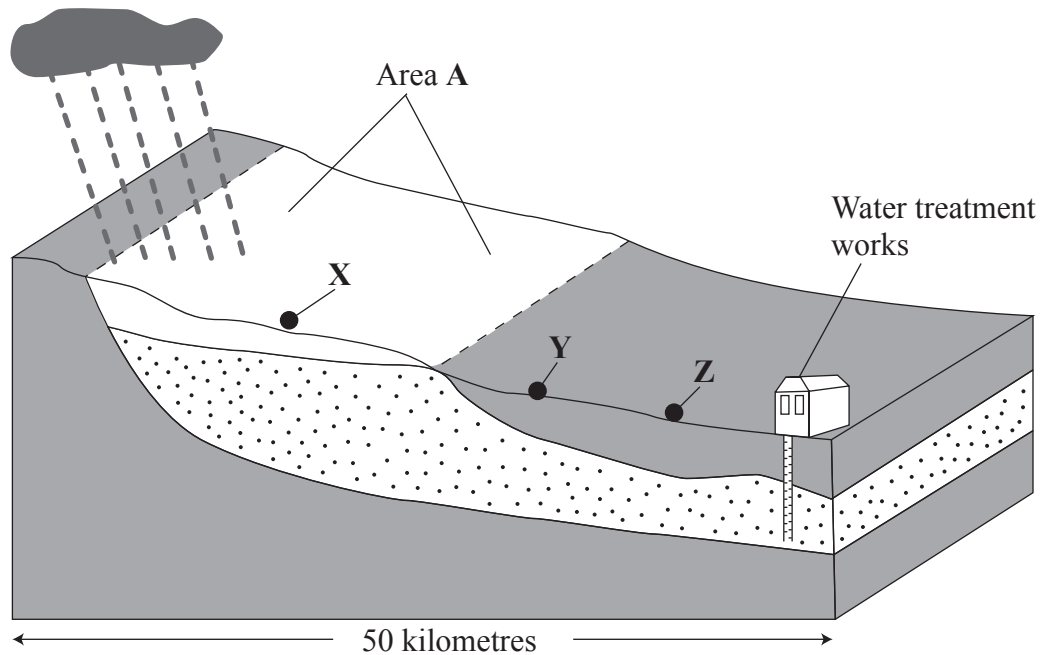
Name processes **A** and **B**.

Process **A** .....

Process **B** .....

(2 marks)

(b) The block diagram shows an area with a layer of permeable chalk rock which is used as a source of drinking water.



- (i) What is the name for a layer of permeable rock which is used as a source of water?

.....  
(1 mark)

- (ii) Water from this source does not need as much treatment as water from a river or reservoir. Name **one** process of treatment which would not be needed for this water and give **one** reason for your choice.

Process .....

Reason why this process is not needed.....

.....  
 .....  
(2 marks)

- (iii) The unshaded area of land (Area **A**) is part of a Nitrate Vulnerable Zone. There are limits on the amount of fertilisers which farmers can use in this area. Use evidence from the diagram to help you to explain why these limits have been imposed.

*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.*

.....  
 .....  
 .....  
 .....  
 .....  
(3 marks)

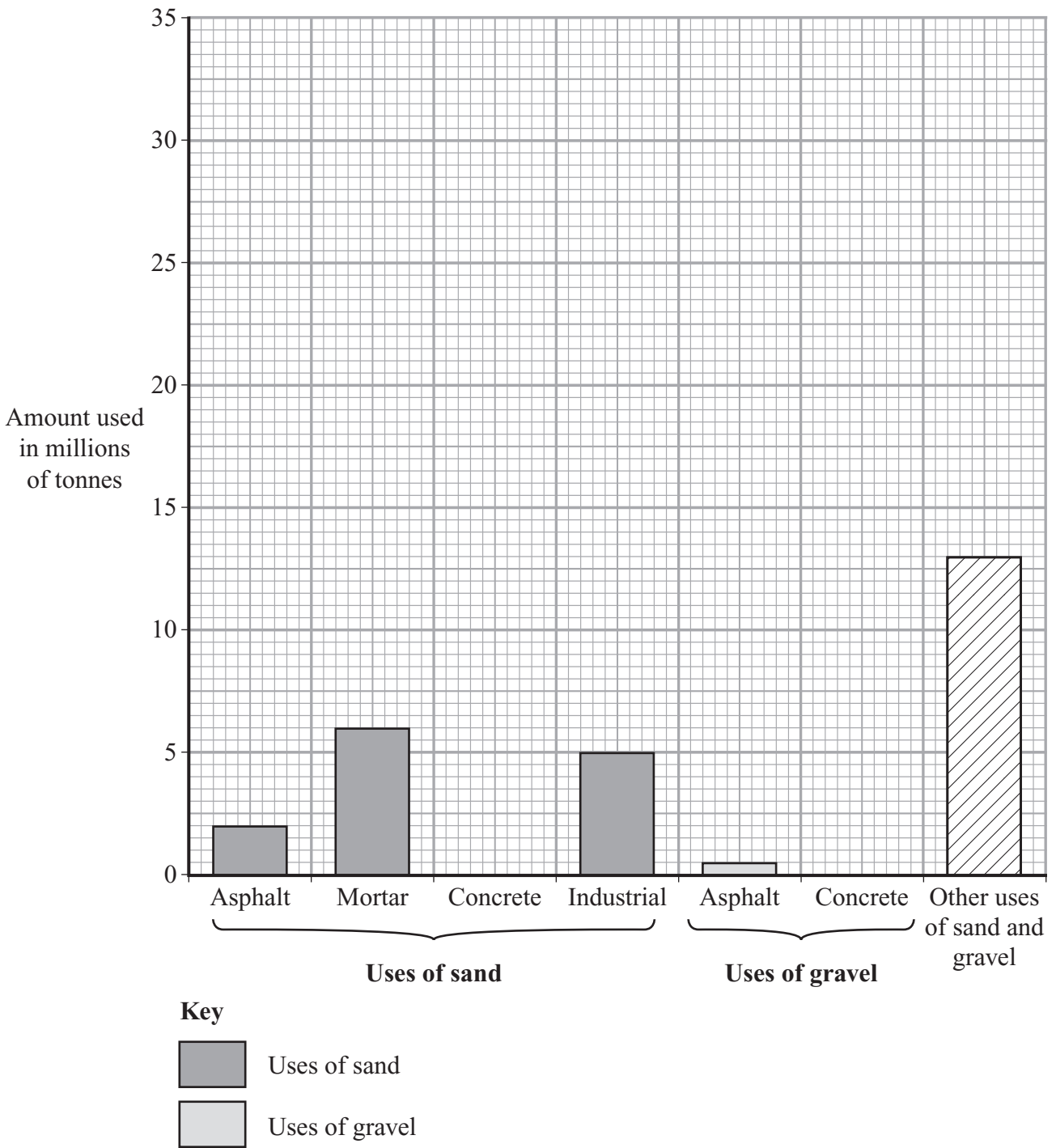
- (iv) **X**, **Y** and **Z** are possible places for a new landfill site. Which place would the company which runs the water treatment works be most strongly against? Explain your choice.

The company would be most strongly against place.....

Explanation .....

.....  
 .....  
 .....  
(2 marks)

7 (a) The partly-completed chart shows the uses of sand and gravel in the United Kingdom in 2004.



(i) Use information from the table to complete the chart.

Resource	Amount used for concrete in millions of tonnes
Sand	33
Gravel	28

(2 marks)

(ii) Calculate the total amount of sand and gravel used in asphalt.

.....million tonnes.

(1 mark)

(iii) Suggest **one** other use for sand and gravel which is not shown in the key to the chart.

.....  
(1 mark)

(b) Most of the sand and gravel used in the United Kingdom is dug from quarries on land, but more and more is now obtained by dredging it from the seabed.

The map shows the areas where companies are allowed to dredge sand and gravel from the seabed around the coast of England and Wales.



**Key**  
 Dredging areas

Source: This map was redrawn from an original made available by The Crown Estate [www.thecrownestate.co.uk](http://www.thecrownestate.co.uk)

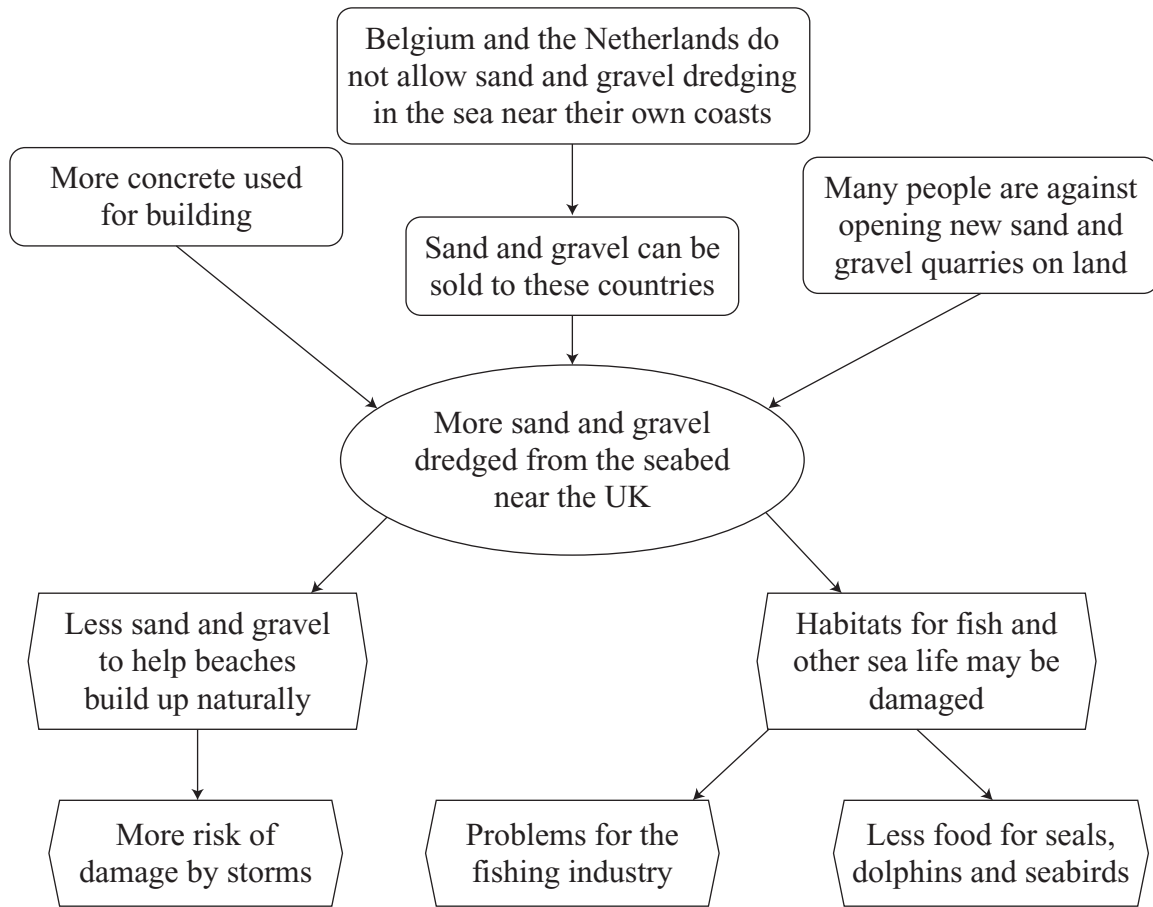
Describe the location of seabed dredging areas shown on the map.

.....  
.....  
.....  
.....

(2 marks)

**Turn over ►**

(c) The diagram shows some of the reasons why more sand and gravel is being dredged from the seabed. It also shows some of the effects which this may have.



(i) Explain **two** possible reasons why Belgium and the Netherlands do not allow sand and gravel dredging in the sea near their coasts. Use information from the diagram to help you.

1.....

.....

.....

2.....

.....

.....

(4 marks)

- (ii) State **two** reasons why people may be against the opening of new sand and gravel quarries on land.

1.....

2.....

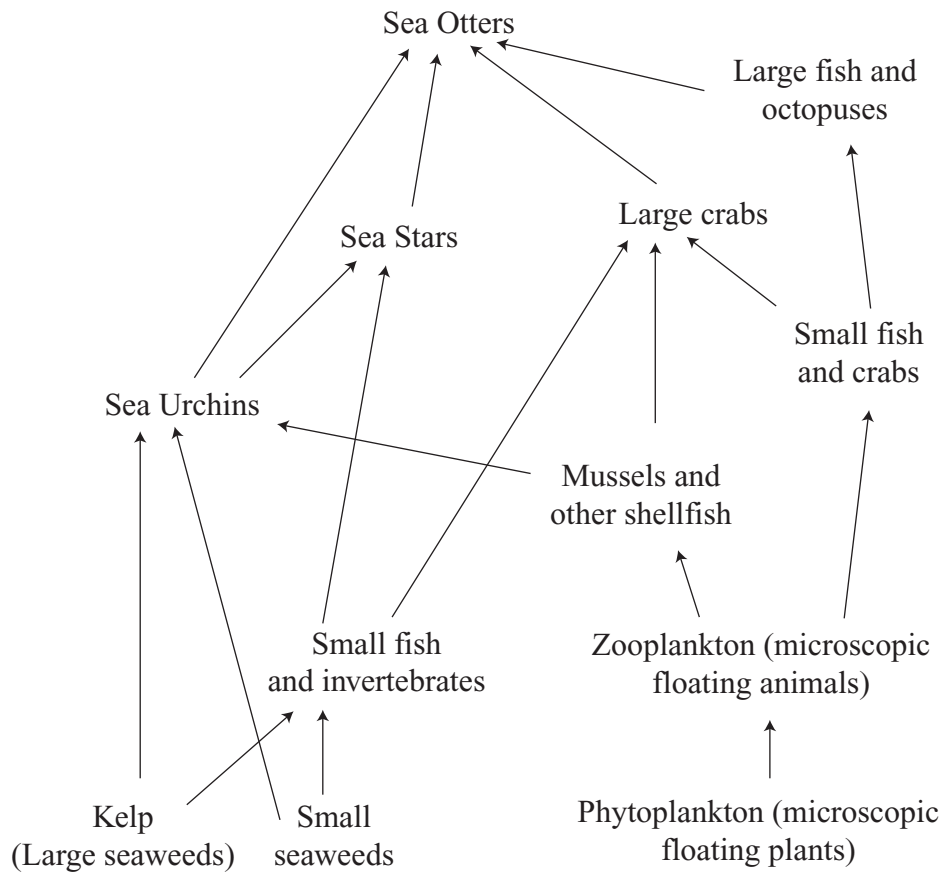
*(2 marks)*

<b>12</b>

**Turn over for the next question**

**Turn over ►**

- 8 The diagram shows some of the organisms which fed off each other in the sea near Alaska during the 1980s. The large Kelp seaweeds formed a habitat for many other organisms.



- (a) (i) What is this type of diagram called?

.....  
(1 mark)

- (ii) Name **one** type of organism eaten by the Sea Stars.

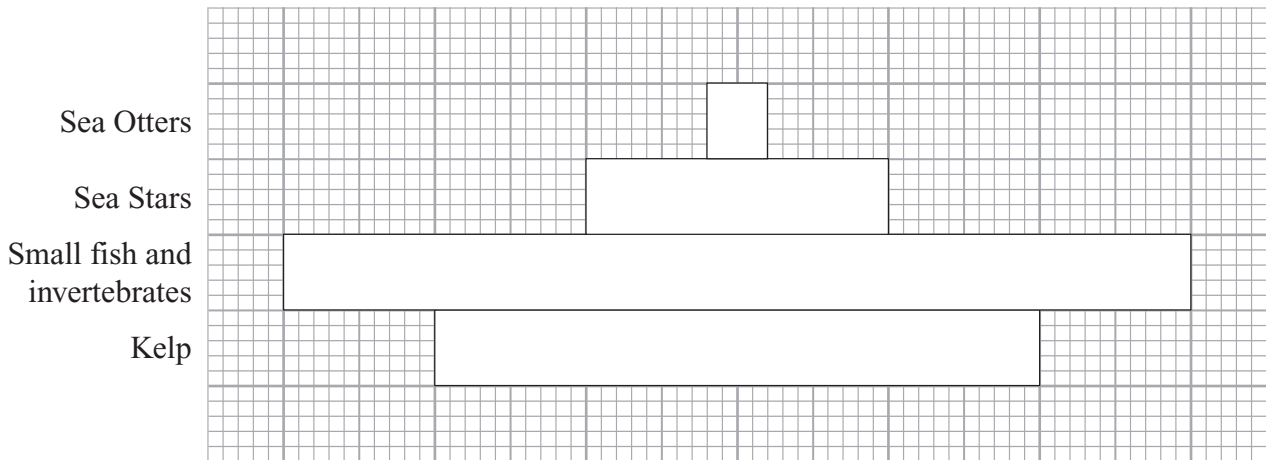
.....  
(1 mark)

- (iii) What is the original source of energy for the organisms shown in the diagram?

.....  
(1 mark)

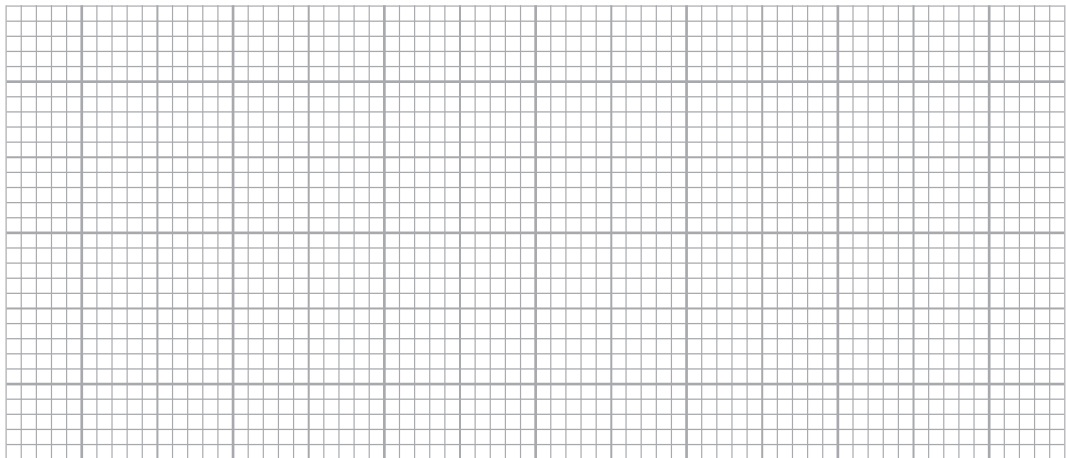


- (b) The diagram shows a pyramid of numbers for one of the food chains in the diagram. It has not been drawn exactly to scale.



- (i) On the grid below draw a pyramid of biomass for the same food chain.

Your diagram does not have to be exactly to scale.



(3 marks)

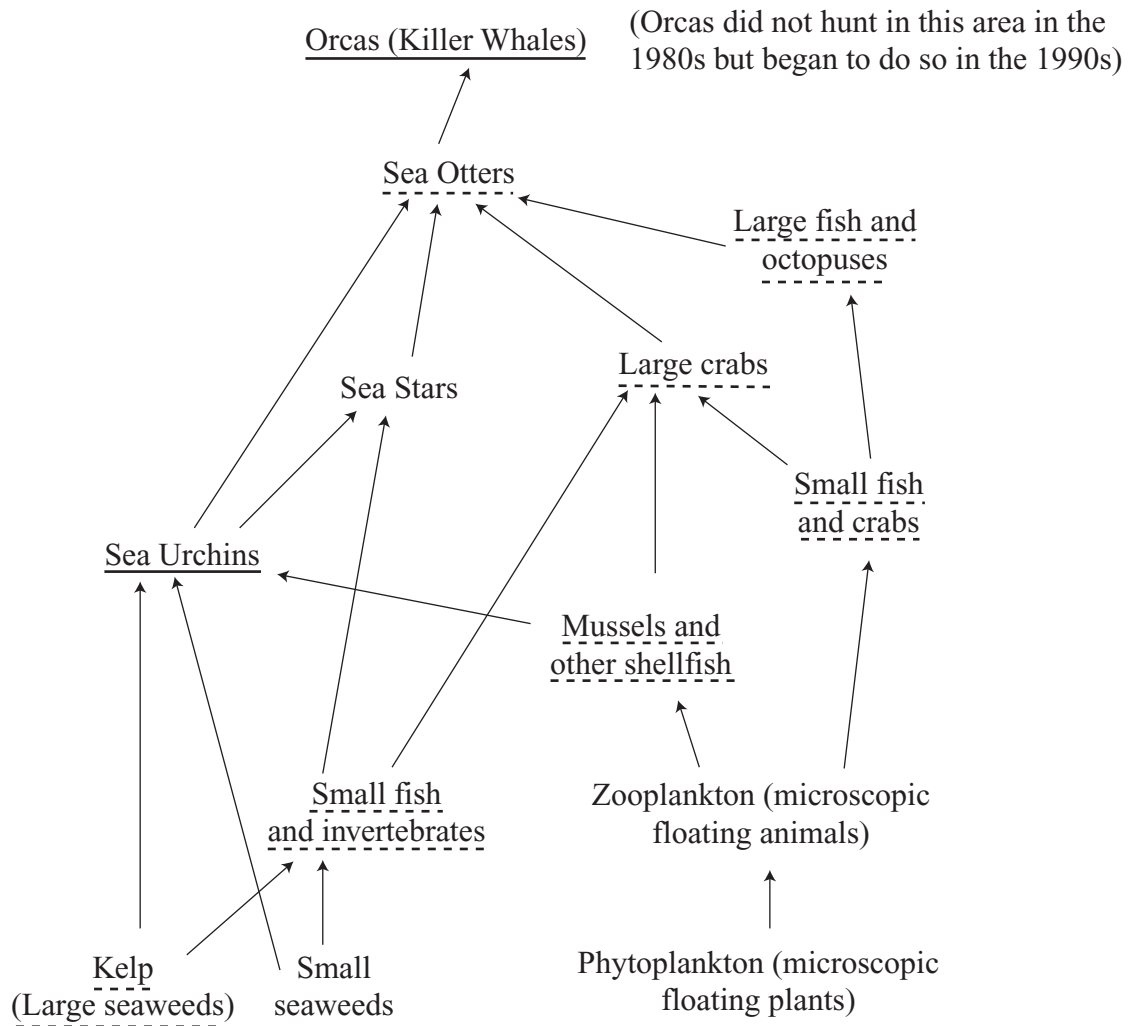
- (ii) Organisms can be shown in pyramids of numbers and pyramids of biomass. Name **one** other type of pyramid which could be used.

.....  
(1 mark)

**Question 8 continues on the next page**

**Turn over ►**

(c) During the 1990s, the feeding relationships in the sea near Alaska changed. The diagram shows some of the changes which happened.



**Key** Organisms which had increased since the 1980s are underlined in bold.  
Organisms which had decreased since the 1980s are shown with dashed underlining.

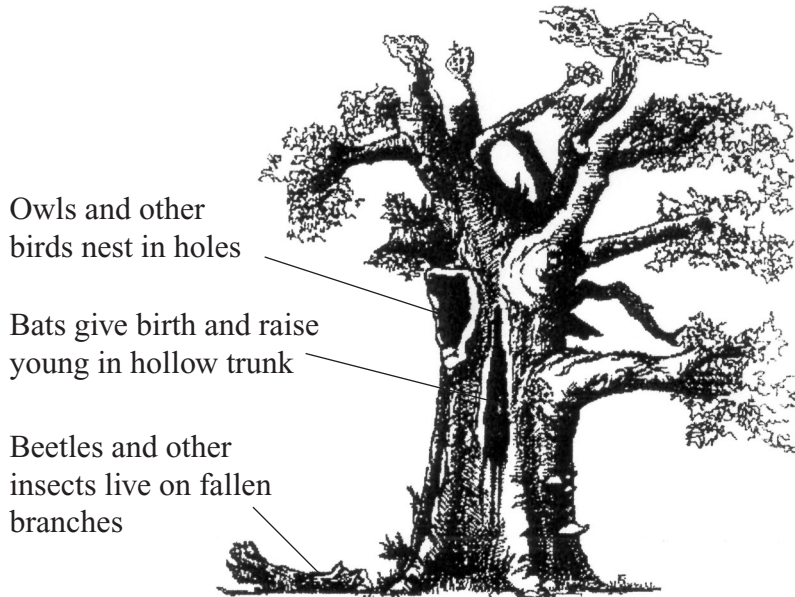
(i) State **one** reason why the number of Sea Otters decreased.

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

(ii) Explain why the number of Kelp plants decreased.

.....  
 .....  
 .....  
 .....  
 .....  
 (2 marks)

9 The sketch shows a veteran oak tree. Veteran trees are usually hundreds of years old. Some people believe that veteran trees are important and should be conserved.



Owls and other birds nest in holes

Bats give birth and raise young in hollow trunk

Beetles and other insects live on fallen branches

Many people think that veteran trees are beautiful.

Some veteran trees are famous and attract tourists to visit them.

The oak is a broad-leaved tree which grows naturally in the United Kingdom.

(a) There are several different reasons for conserving trees and other organisms. Use information from the diagram to state **one** reason for conserving veteran trees which fits **each** of the following descriptions.

(i) An aesthetic reason .....

.....

*(1 mark)*

(ii) An ecological reason.....

.....

*(1 mark)*

(iii) An economic reason.....

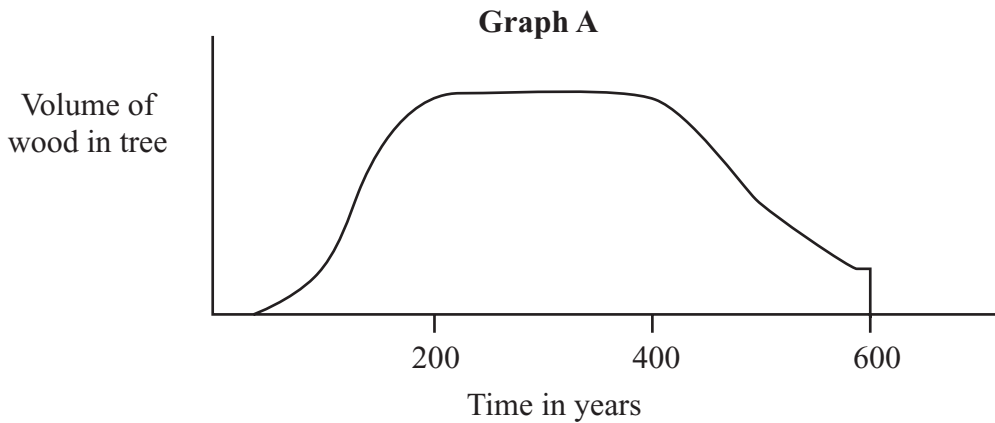
.....

*(1 mark)*

**Question 9 continues on the next page**

**Turn over ►**

- (b) (i) **Graph A** shows the changes in the volume of an oak tree growing in natural woodland.



Describe the changes in the volume of wood in the oak tree shown in **Graph A** during the first four hundred years of its life.

.....

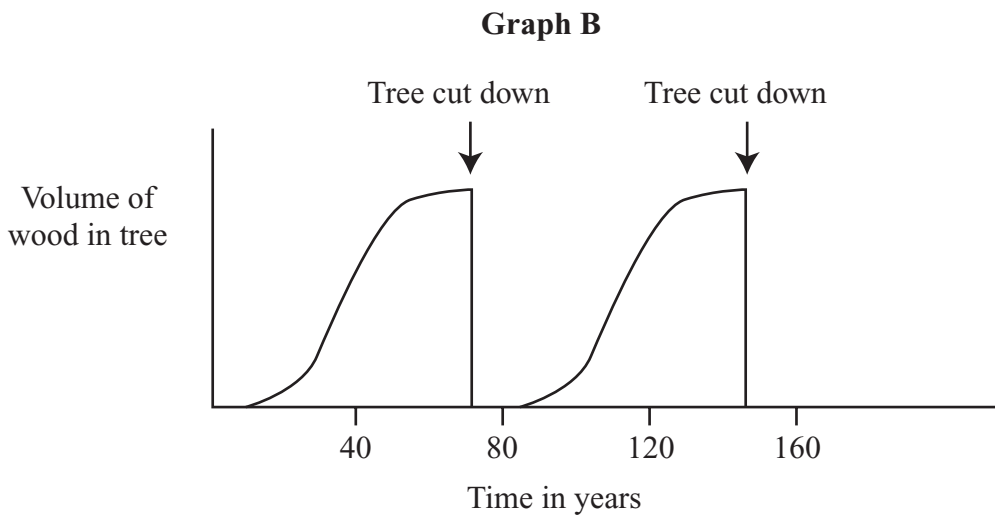
.....

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.....

*(3 marks)*

- (ii) **Graph B** shows the changes in the volume of spruce trees growing in two crops in a commercial forestry plantation.



Explain why the spruce trees in the commercial forestry plantation are cut down when they are about seventy years old.

.....

.....

.....

.....

*(2 marks)*

(c) (i) Explain **two** reasons why some people are against commercial forestry plantations.

1.....  
.....  
.....

2.....  
.....  
.....

*(4 marks)*

(ii) State **one** reason why some people are in favour of commercial forestry plantations.

.....  
.....

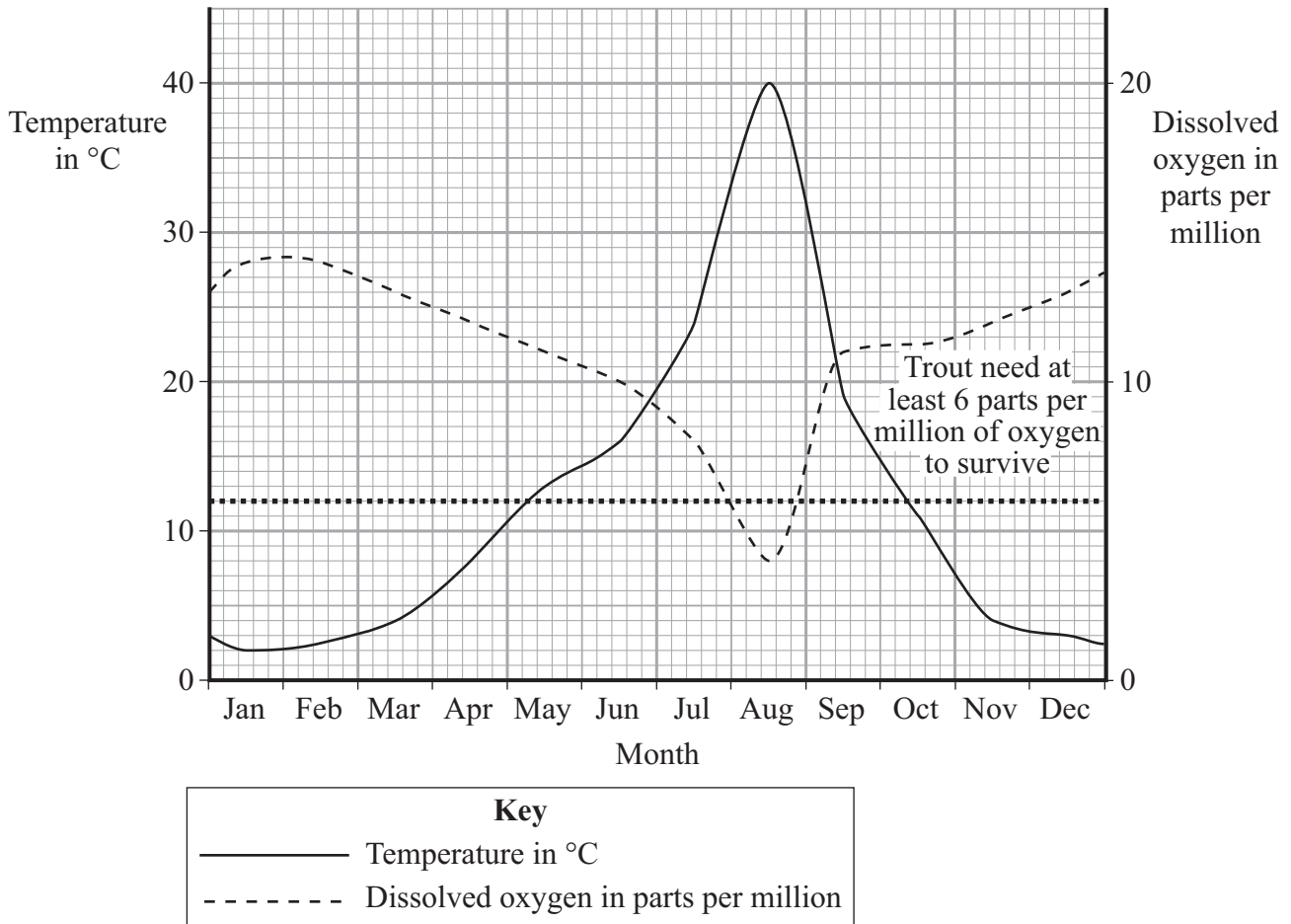
*(1 mark)*

<b>13</b>

**Turn over for the next question**

**Turn over ►**

10 The graph shows information about the temperature and the amount of oxygen dissolved in the water of a stream.



(a) (i) What does the graph show about the way in which temperature and the amount of dissolved oxygen are related to each other?

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

(ii) In August there was a problem at a local factory. Large amounts of hot water escaped into the stream.  
 Name the type of pollution which can be caused by hot water.

.....  
 (1 mark)

(iii) Name the process for which trout and other organisms need oxygen.

.....  
 (1 mark)

(iv) Explain why people who fish for trout in the stream were angry about the problem at the factory.

.....  
.....  
.....  
.....

(2 marks)

(b) (i) The company which owned the factory was fined for not keeping to its Discharge Consent.

What is a *Discharge Consent*?

.....  
.....

(1 mark)

(ii) Name the government organisation which is responsible for controlling pollution.

.....

(1 mark)

(c) Scientists used a dissolved oxygen meter to measure the amount of oxygen in samples of water taken from the stream.

State **two** things that they could have done to make sure that the way in which they collected their samples would help to make their results reliable.

1 .....

.....

2 .....

.....

(2 marks)

9

**END OF QUESTIONS**

**There are no questions printed on this page**

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