

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2007

ENVIRONMENTAL SCIENCE
Written Paper
Higher Tier

3441/H
H



Wednesday 20 June 2007 9.00 am to 11.00 am

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

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 1(b)(iii) and 10(b) 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 processes used in the treatment of drinking water.

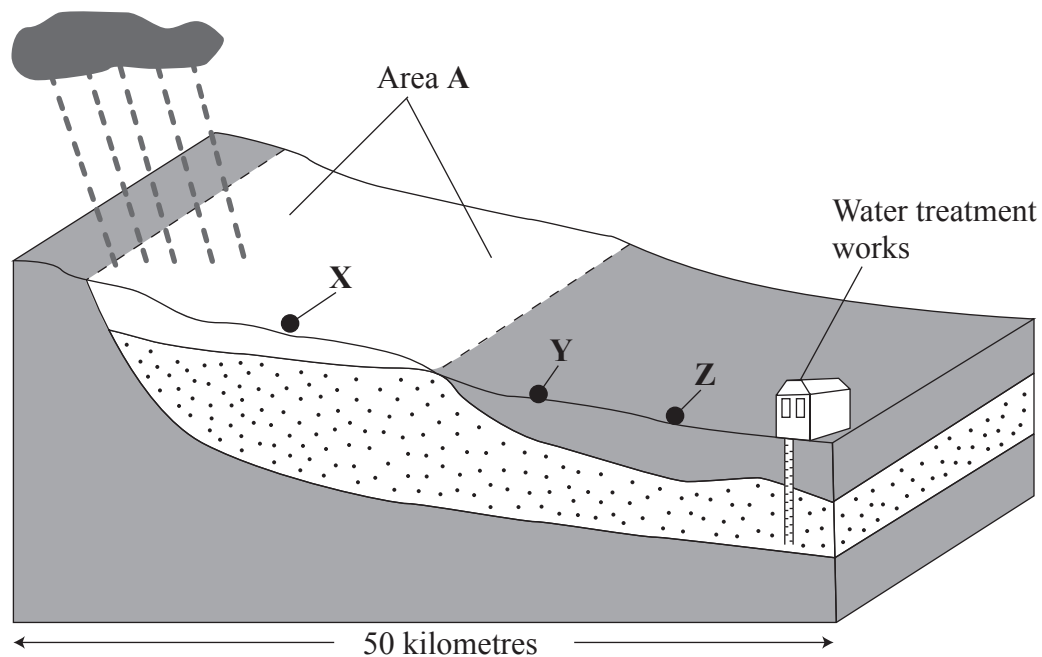
Process	Definition
Screening	Large objects are removed from the water
Sedimentation	Water is held in tanks where small particles sink to the bottom
Process A	Water is passed through sand or charcoal to remove the smallest particles
Process B	Harmful bacteria, viruses and other organisms are killed

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.



Impermeable rock (clay)



Permeable rock (chalk)



Permeable rock saturated by 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.

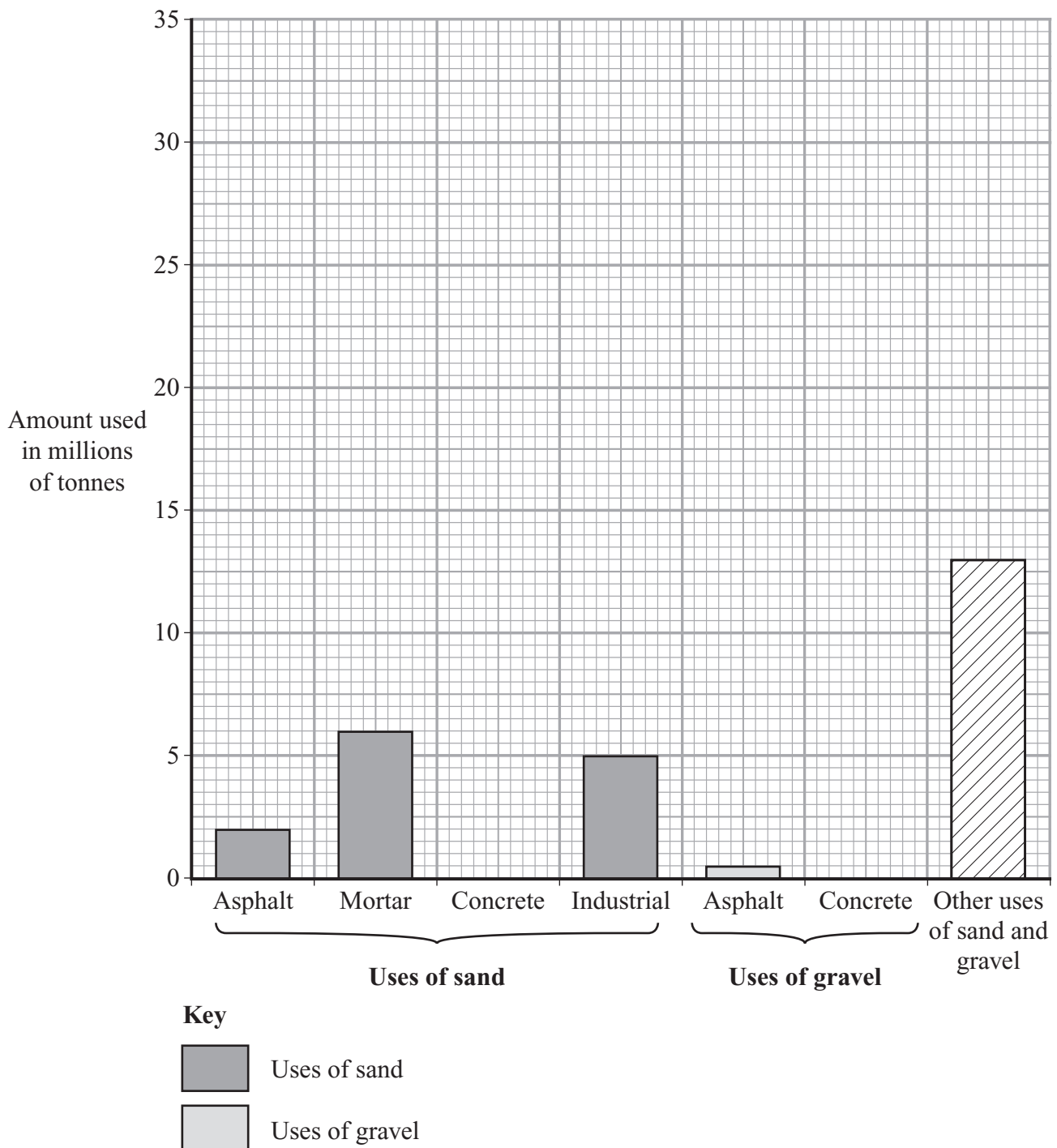
The company would be most strongly against place.....

Explanation

.....

(2 marks)

- 2 (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

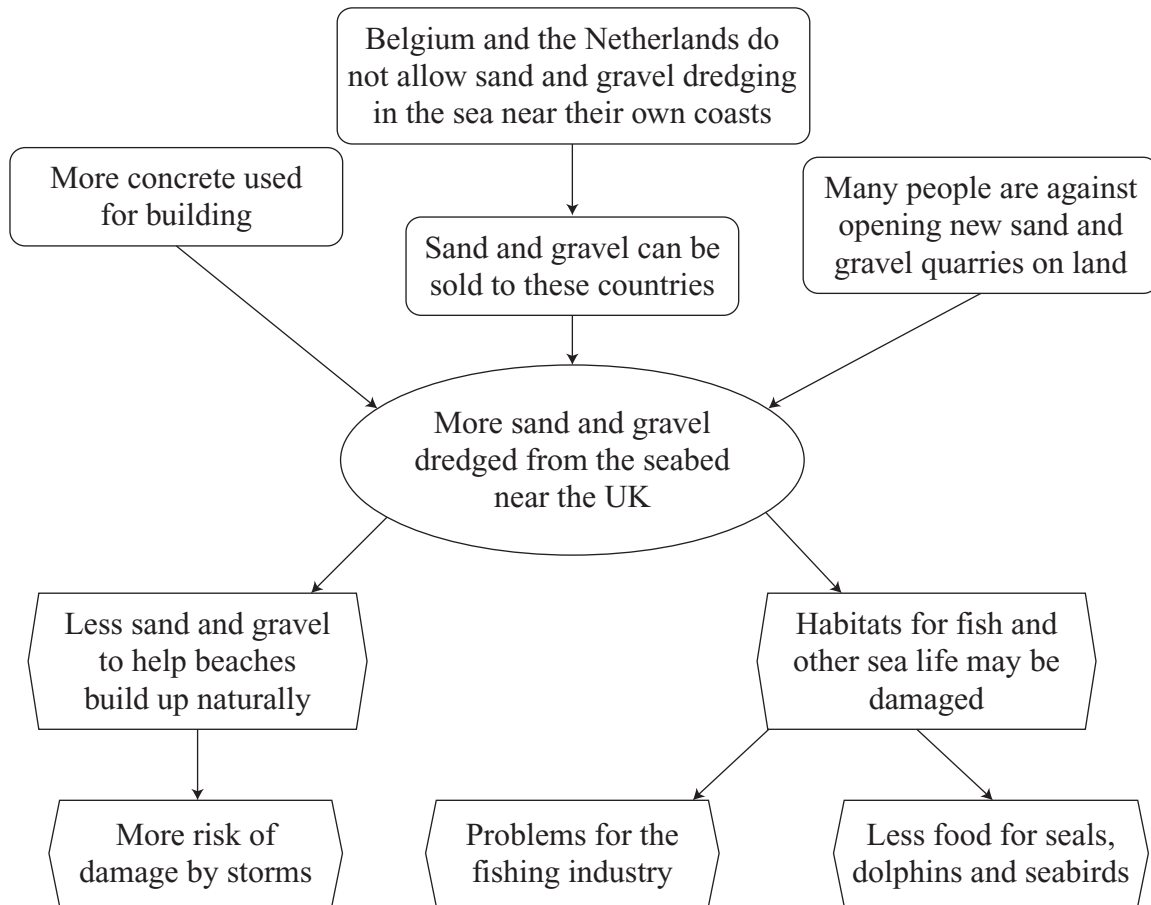
Describe the location of seabed dredging areas shown on the map.

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

(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.....

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2.....

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(4 marks)

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

1.....

2.....

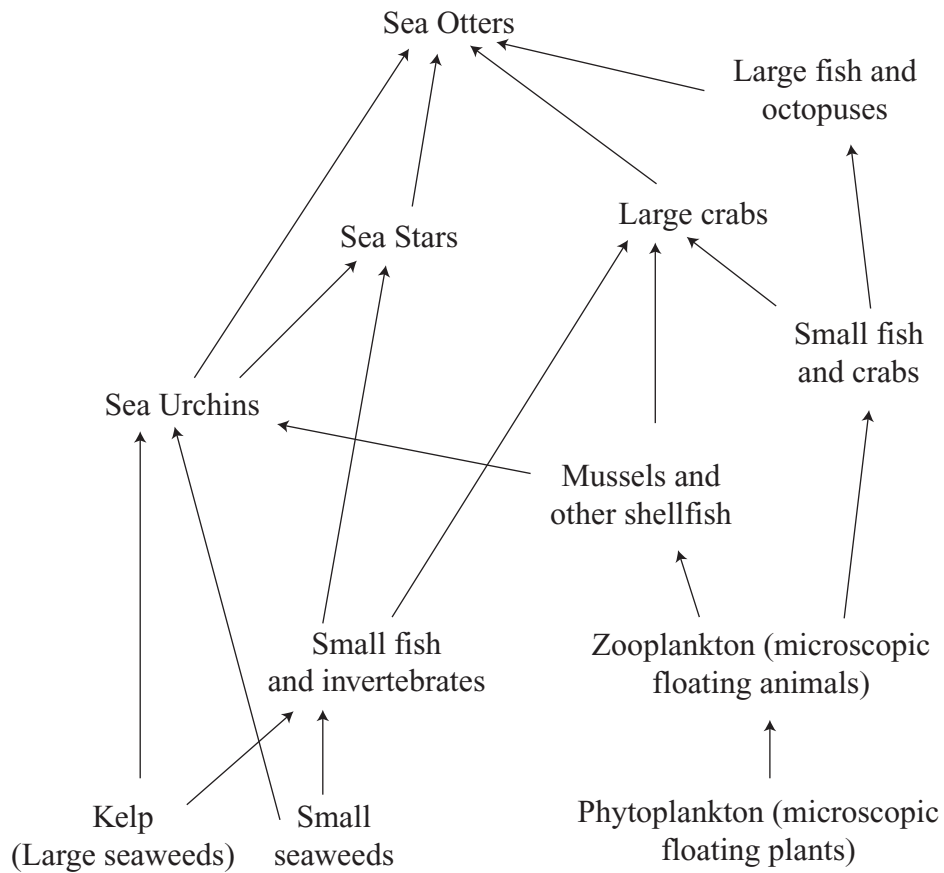
(2 marks)

12

Turn over for the next question

Turn over ►

- 3 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)

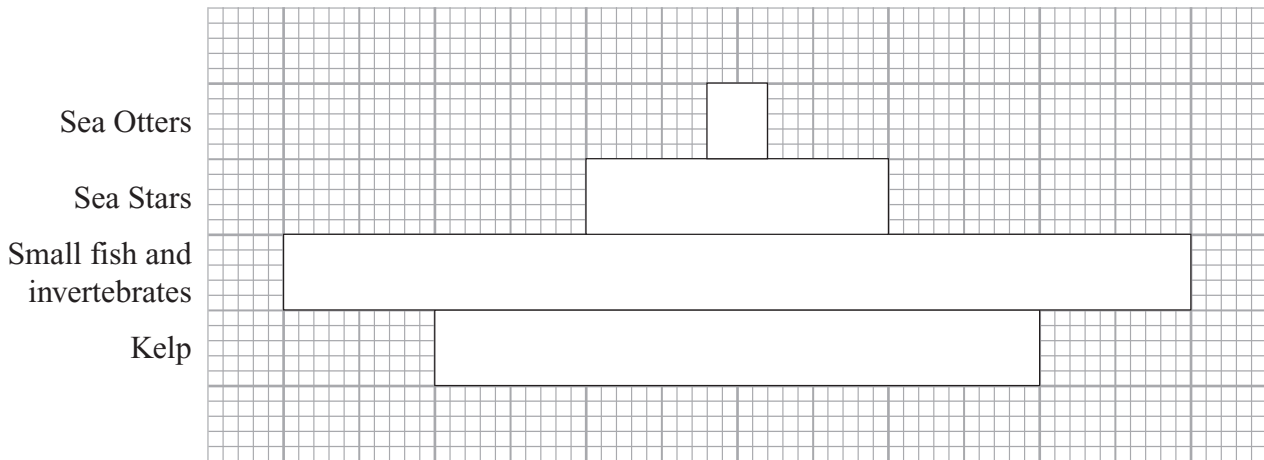
- (ii) Name **one** type of organism eaten by the Sea Stars.

.....
(1 mark)

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

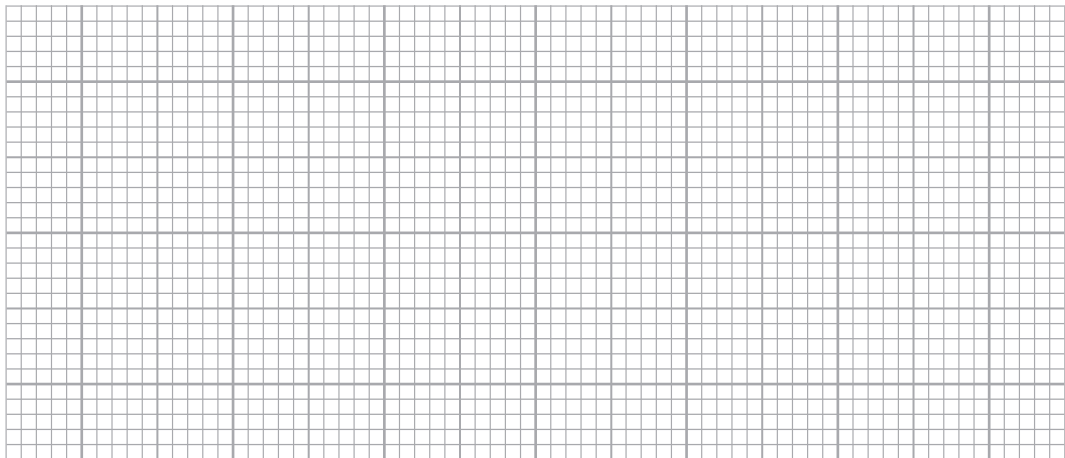
.....
(1 mark)

- (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)

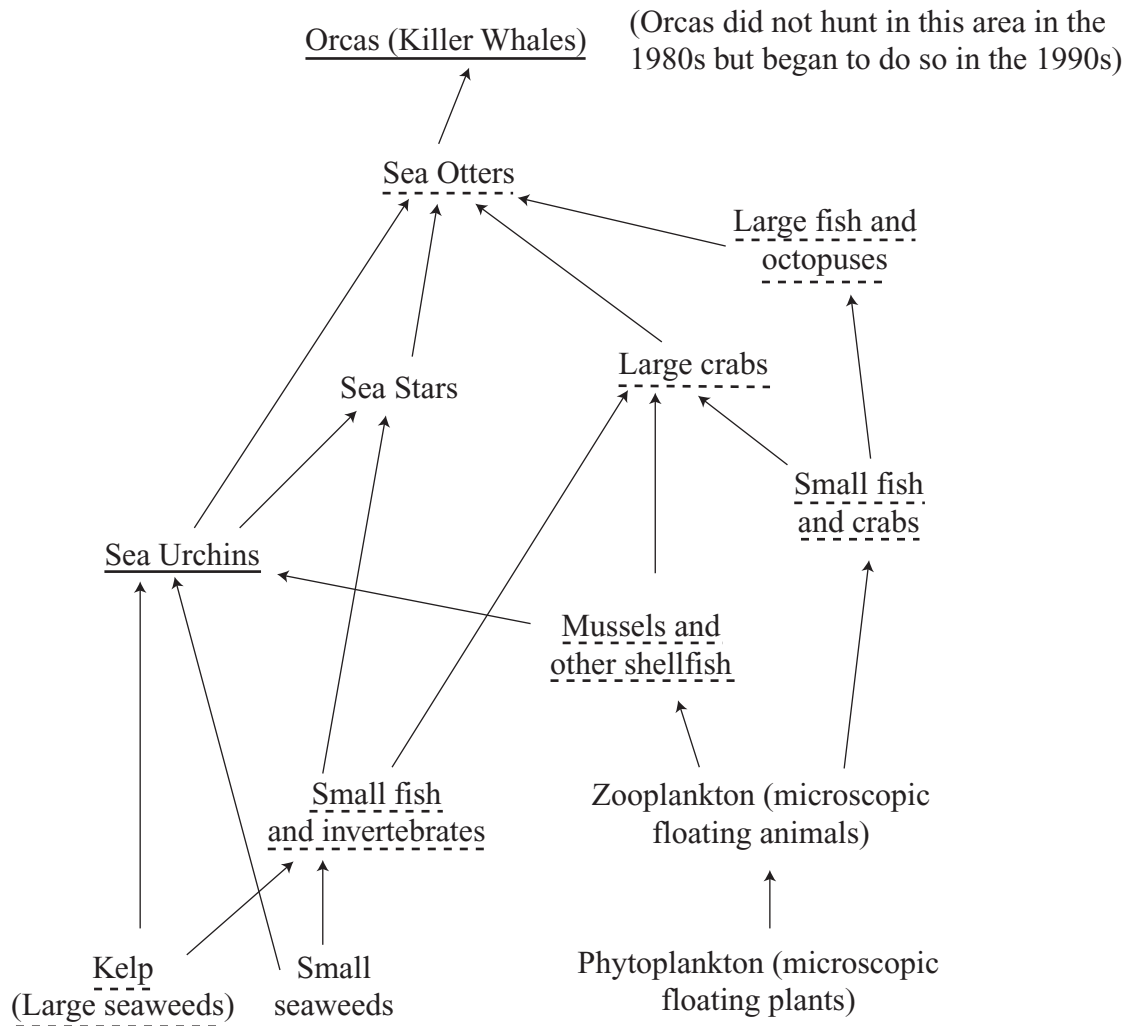
- (ii) Organisms can be shown in pyramids of numbers and pyramids of biomass. Name **one** other type of pyramid which could be used.

.....
(1 mark)

Question 3 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.

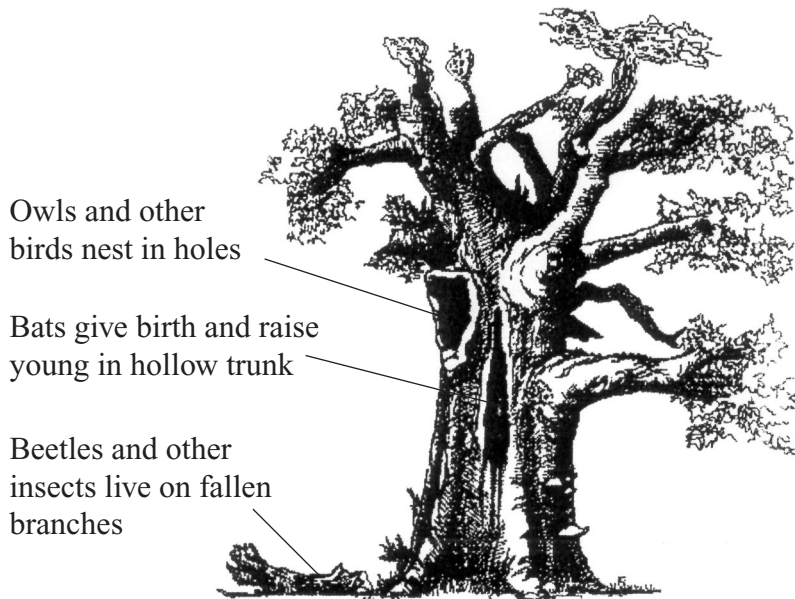
(i) State **one** reason why the number of Sea Otters decreased.

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

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

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

4 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.



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)

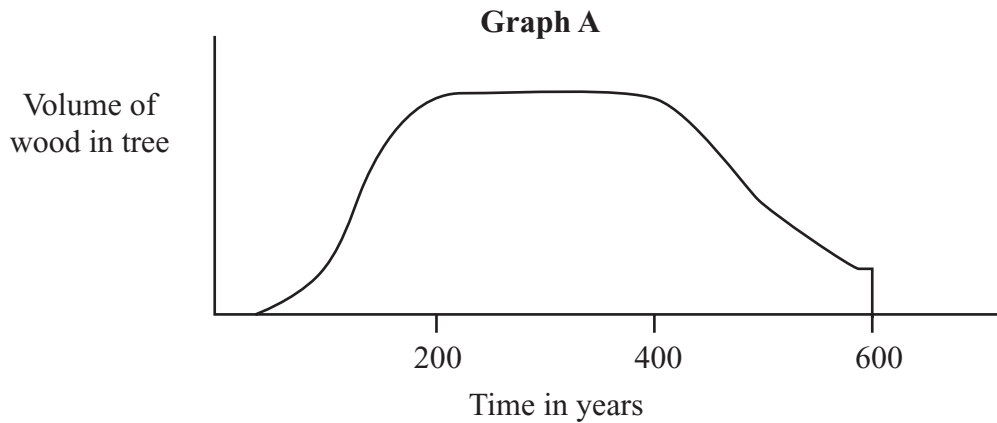
(ii) An ecological reason.....
.....
(1 mark)

(iii) An economic reason.....
.....
(1 mark)

Question 4 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.

.....

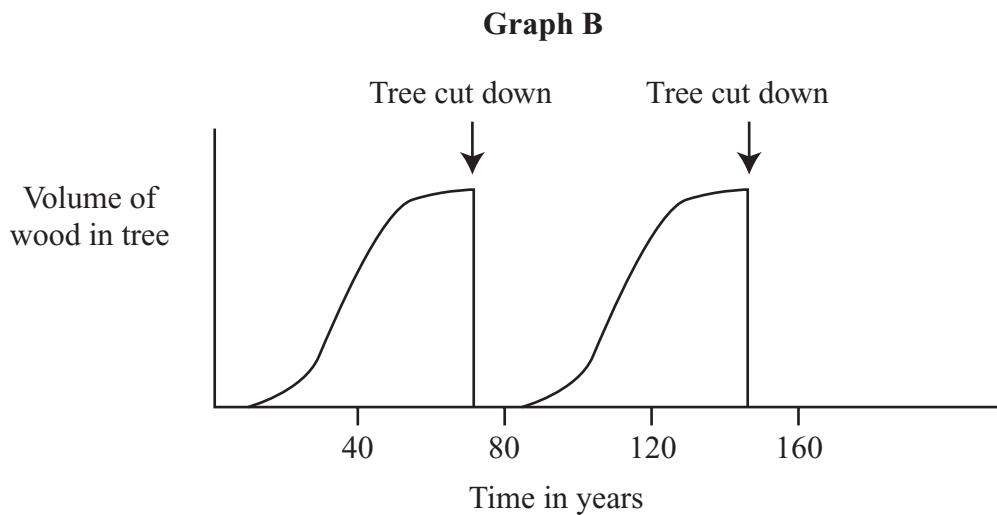
.....

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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.

.....

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(2 marks)

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

1.....

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(4 marks)

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

.....

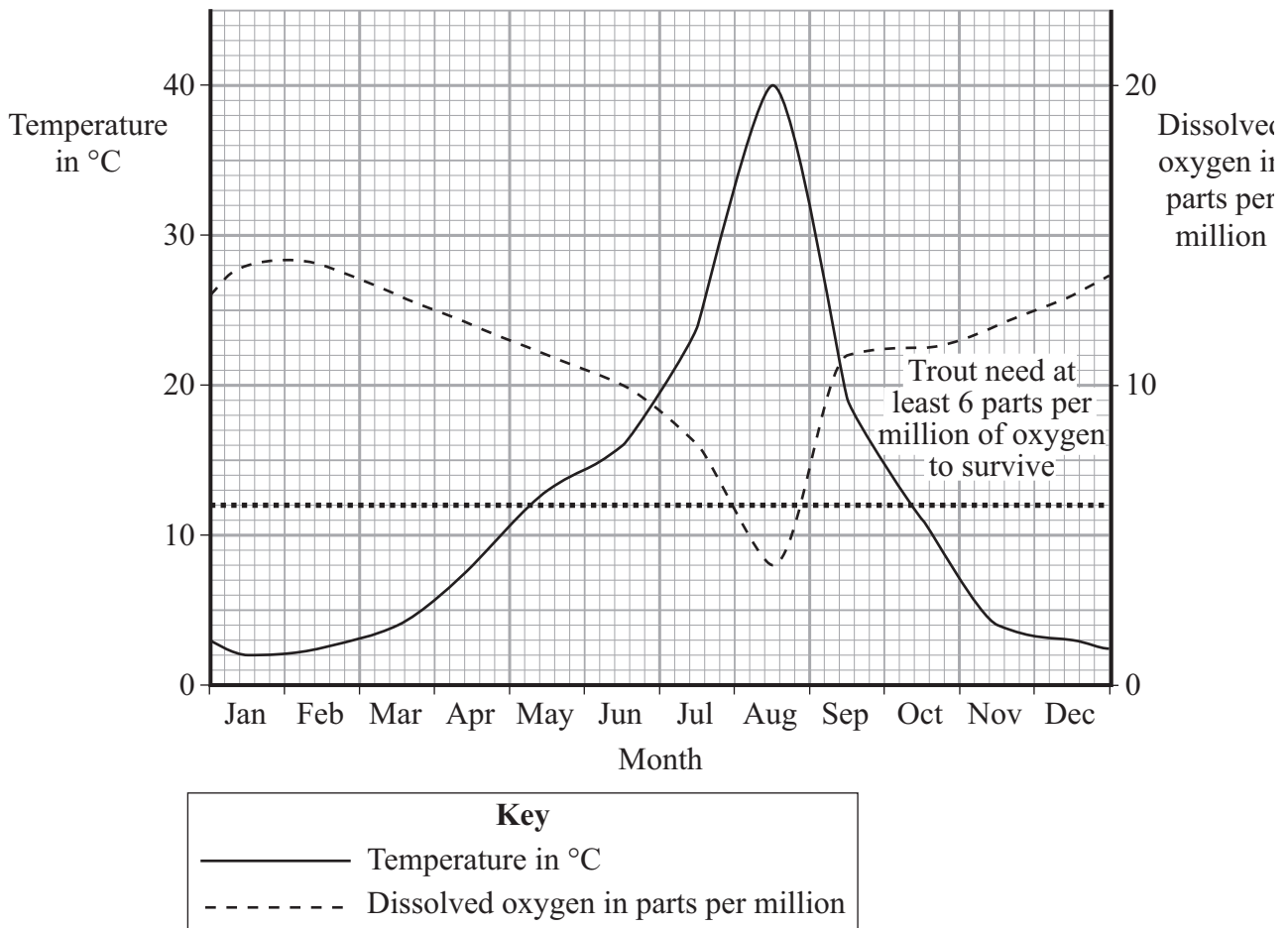
.....

(1 mark)

Turn over for the next question

Turn over ►

5 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

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2

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(2 marks)

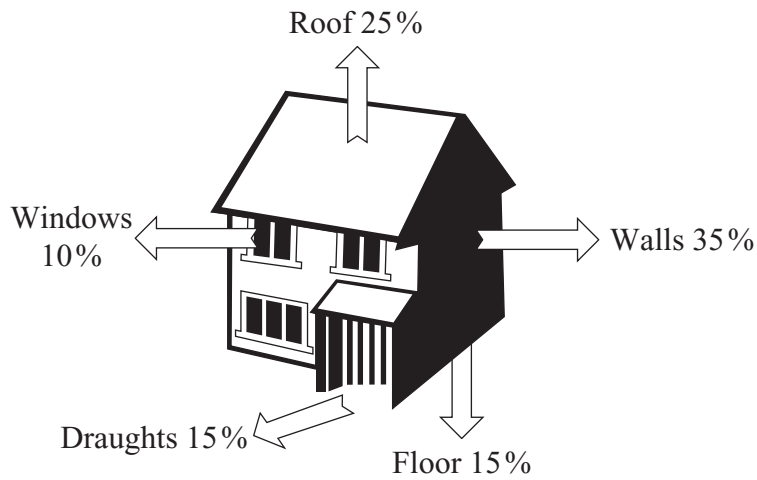
9

Turn over for the next question

Turn over ►

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6 The diagram shows heat loss from a typical house.

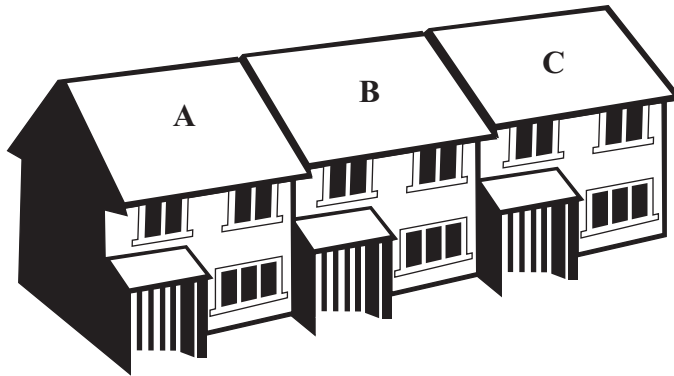


- (a) (i) A household spends £480 per year on heating their house. Calculate the amount of money wasted by heat loss through the walls.

£

(1 mark)

- (ii) The sketch shows three houses. Which house would be the cheapest to heat? Explain your answer.



House.....

Explanation

.....

.....

.....

(3 marks)

Turn over ►

(b) The graph shows the percentage of houses in England with different types of insulation.



(i) Which type of insulation has increased in use most since 1976?

.....
(1 mark)

(ii) Suggest **one** reason why loft insulation is the most used form of insulation in houses.

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

(iii) The Government wants people to reduce the amount of energy that they use to heat their homes.

Which **one** of the methods of insulation is likely to be most helpful with this in the future? Explain your choice.

Type of insulation.....

Explanation

.....
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.....
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(5 marks)

(c) Reducing the amount of energy that we use to heat our homes is one method of energy conservation.

Explain **two** other methods of conserving energy.

1

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2

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(4 marks)

15

Turn over for the next question

Turn over ►

- 7 (a) The table shows the results of an investigation into run-off and soil erosion.

	Type of land use	% of precipitation which runs off	Amount of soil eroded from the area in tonnes per hectare per year
Area A		0.8	0.01
Area B		7.0	0.4
Area C		48.0	43.0

- (i) Choose the correct type of land use for each of the areas which were studied. Write the correct letters in the spaces in the table above.

X Grassland (not ploughed)

Y Forest

Z Cereal crop (grown on land which is ploughed)

(2 marks)

- (ii) Explain the choice that you have made in part (i) for **Area A**.

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(4 marks)

(b) The photographs show two different methods of controlling soil erosion caused by run-off.

Photograph A

The photograph is not reproduced here due to third-party copyright constraints.

Photograph B



Source: David Ozsvath, University of Wisconsin

(i) Name the two methods of controlling soil erosion.

Photograph A.....

Photograph B.....

(2 marks)

(ii) Choose **one** of the photographs and explain how the erosion control method shown in the photograph works.

Photograph.....

Explanation

.....

.....

.....

(2 marks)

(c) Soil erosion can also be caused by the wind. Explain **one** method of controlling this kind of soil erosion.

.....

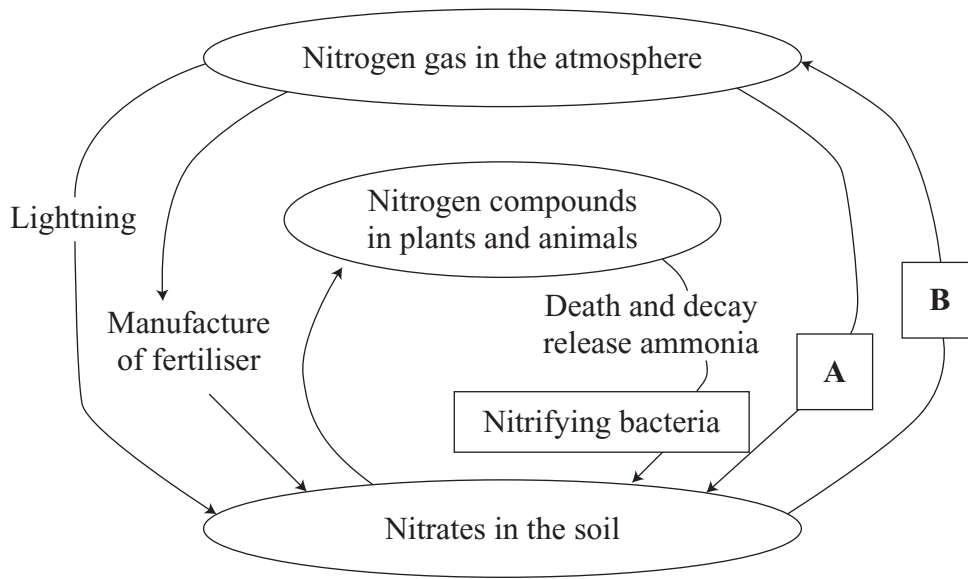
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(2 marks)

8 The diagram shows some of the stores and processes in the nitrogen cycle.



(a) (i) Nitrogen from the atmosphere is transferred to the store of nitrates in the soil. Name **one** natural process which causes this.

.....
(1 mark)

(ii) The type of bacteria labelled **A** on the diagram is often found in nodules on the roots of a particular group of plants. Name the type of bacteria and the group of plants on which it is found.

Type of bacteria.....

Group of plants

(2 marks)

(iii) Name the type of bacteria labelled **B** on the diagram.

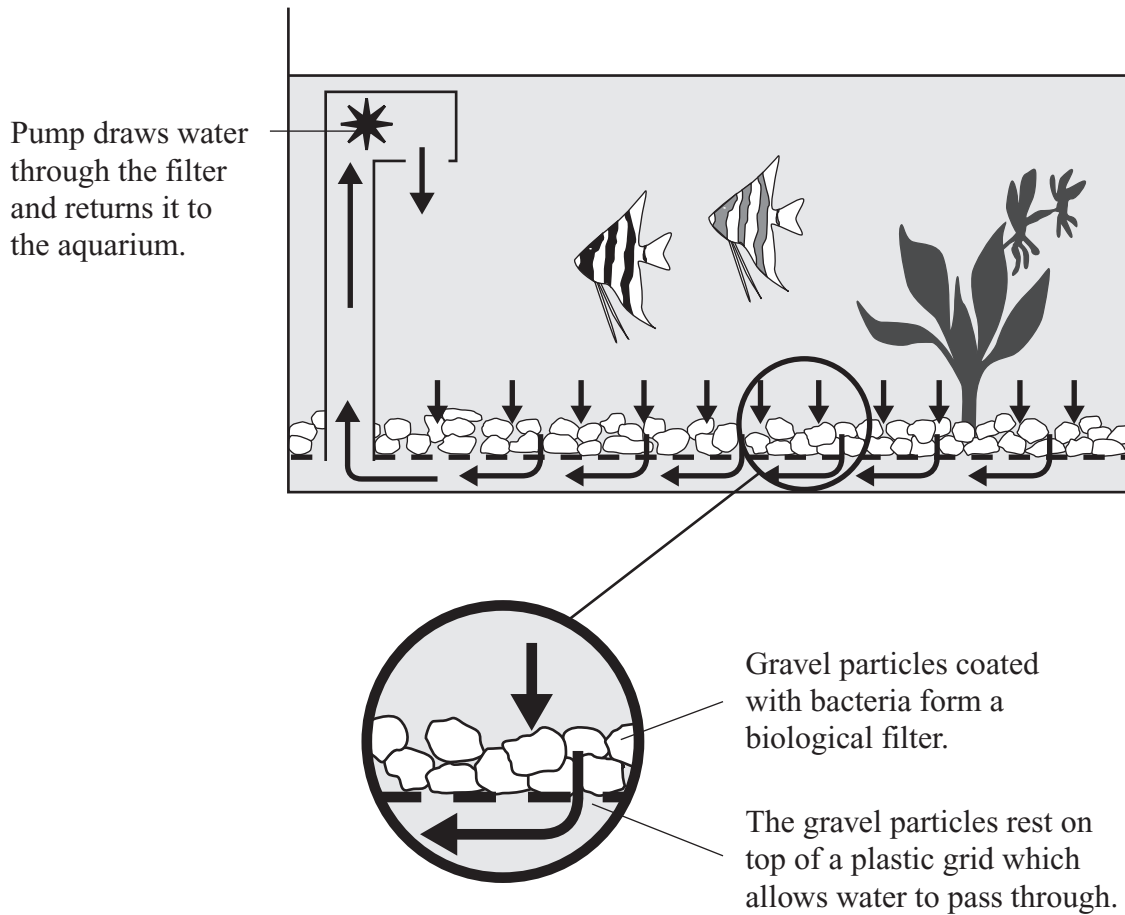
.....
(1 mark)

(iv) The diagram shows that nitrogen in the atmosphere can be affected by lightning. The same process can happen in engines and power station boilers. Explain how waste gases from these sources may help some farmers to make more profit.

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(3 marks)

- (b) The diagram shows a biological filter system in an aquarium. This system is needed to stop harmful amounts of ammonia from building up in the aquarium.



- (i) Ammonia is excreted by the fish.
Which type of bacteria involved in the nitrogen cycle will convert the ammonia into nitrates?

.....
(1 mark)

- (ii) Which living organisms in the aquarium will use the nitrates produced from the ammonia?

.....
(1 mark)

- (iii) When fish are put into a new aquarium with clean water and gravel they sometimes die after a few days because of ammonia poisoning.
Explain why this may happen.

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(2 marks)

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- 9 (a) The box gives information about changes in the way in which farmers are given support by the European Union through CAP.

Changes to the CAP

Before 2005, the amount which farmers were paid by the European Union depended on the amount of food that they produced. The more crops they grew or the more animals they kept the more money they got.

From 2005 onwards, each farmer has received a Single Payment. This is based on the area of the farm but does not depend on the amount that they produce. They can also apply for extra money if they farm in ways which help the environment, for example by providing habitats for wildlife.

- (i) What do the letters CAP stand for?

.....
(1 mark)

- (ii) Many people did not like the way the CAP worked before 2005 because it led to the problem of ‘food mountains’. Explain why this problem happened.

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

- (iii) Most wildlife conservation organisations in the United Kingdom are in favour of the changes to the CAP.

Name **one** nature conservation organisation that is run by the government and **one** that is in the voluntary sector.

Government organisation.....
.....
Voluntary sector organisation.....
.....
(2 marks)

Turn over ►

- (b) The box gives details of an investigation of the wildlife on organic farms and on ‘ordinary’ farms which do not use organic methods.

Organic farms are better for wildlife

- The scientists looked at 80 pairs of farms. One farm in each pair was an organic farm and the other was an ‘ordinary’ farm.
- All the farms were in lowland areas of England and they all produced cereal crops.
- The organic farms had more hedgerows than the ‘ordinary’ farms.
- When the scientists compared the numbers of different types of wildlife they found that the organic farms had 85 % more plant species, 33 % more bats, 17 % more spiders and 5 % more birds.

- (i) Explain **three** different ways in which the scientists who carried out this investigation tried to make sure that their results were reliable.

1.....
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2.....
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3.....
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(6 marks)

- (ii) Use information from the box to help you to explain **one** reason why organic farms have more wildlife than ‘ordinary’ farms.

.....

.....

.....

.....

(2 marks)

- (iii) Explain **one** other reason why organic farms may have more wildlife.

.....

.....

.....

.....

(2 marks)

15

Turn over for the next question

Turn over ►

10 The photograph shows a coal-fired power station.



Source: M J WILLIS, www.mike-willis.com

(a) (i) Name the structures labelled **A** and **B** on the photograph.

A.....

B.....

(2 marks)

(ii) Explain why the structures labelled **A** are needed.

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(4 marks)

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