Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

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General Certificate of Secondary Education
June 2006

ASSESSMENT and QUALIFICATIONS ALLIANCE

ENVIRONMENTAL SCIENCE **3441/H**
Written Paper
Higher Tier

H

Wednesday 21 June 2006 9.00 am to 11.00 am

For this paper you must have:
- a ruler

You may use a calculator.

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 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 2(b)(i) and 10(b)(ii) should be answered in continuous prose. Quality of Written Communication will be assessed in these answers.

For Examiner's Use			
Number	Mark	Number	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 The extract contains information about a planned water management scheme in Spain.

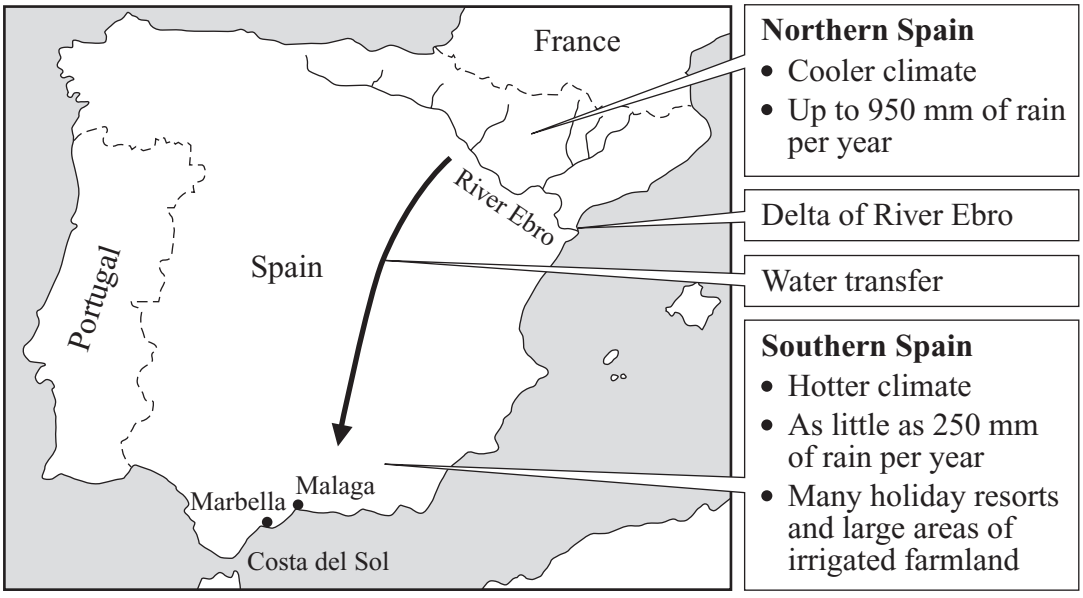
The Ebro Water Transfer Scheme

In 2001 the government of Spain gave permission for a plan to build dams along the River Ebro in the north of the country. The water would be sent to southern Spain through pipelines and canals.

The Ebro Delta is an area of marshes and lakes where the River Ebro enters the sea. It is very important as a habitat for many species of birds. Huge numbers of about 300 different species, including flamingos, have been seen there.

The Ebro Delta is built up from silt carried by the river. A continuous supply is needed to replace silt removed by the action of the sea. The River Ebro also provides large amounts of fresh water. This is vital for the plant life and the birds which live there.

In 2004 a new Spanish government announced that the Ebro Water Transfer Scheme would not go ahead after all.



(a) The people who planned the scheme believed that the region around the River Ebro had surplus water.
State **two** reasons why they may have thought this.

1 .....

.....

2 .....

.....

(2 marks)

(b) Using information from the extract state and explain **two** reasons why southern Spain suffers from water shortages.

1 .....

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2 .....

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(4 marks)

(c) Explain why environmental campaigners believed that the Ebro Water Transfer Scheme would damage wildlife habitats.

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(4 marks)

(d) To reduce the problem of water shortage, people in southern Spain are being asked to use less water.
Suggest **two** ways in which they could do this.

1 .....

2 .....

(2 marks)

12

2 The shrub layer in woodland is made up of bushes and shrubs growing below the taller trees. Blue Tits and Pied Flycatchers are two species of birds which live in woodlands. The chart shows how changing the percentage cover of the shrub layer can affect the numbers of these birds.

The chart is not reproduced here due to third-party copyright restraints. Printed copies of this paper can be obtained by ordering 3441/H from AQA Publications. Tel: 0161 953 1170

(a) (i) State what happens to the number of Pied Flycatchers as the percentage of the ground covered by the shrub layer increases.

.....

(1 mark)

(ii) State what happens to the number of Blue Tits as the percentage of the ground covered by the shrub layer increases.

.....

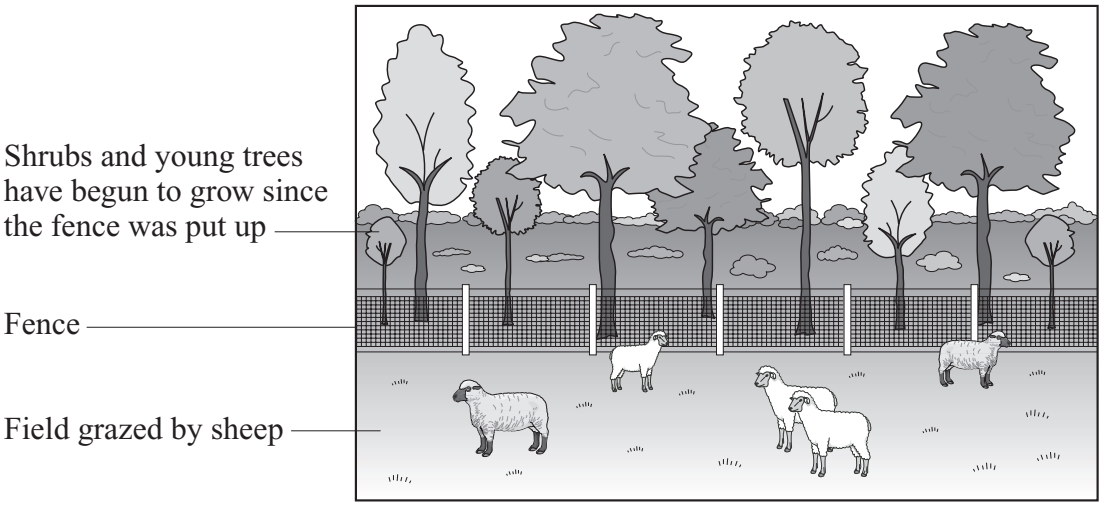
(1 mark)

(iii) A survey of an area of woodland found 50 % of the ground covered by the shrub layer and 46 Pied Flycatchers breeding. How many Blue Tits would you expect to find in the same area?

..... *(1 mark)*

(b) Many woods in Wales have only a small percentage of the ground covered by bushes and shrubs. This is because sheep graze under the trees. The sheep eat young shrubs before they can grow. They can also eat young tree seedlings.

The sketch shows a field and an area of woodland in a nature reserve where Pied Flycatchers are a protected species. A fence has been put up to stop sheep from getting into the woodland.



(i) Explain **one** possible advantage and **one** possible disadvantage for nature conservation if the fence is kept in place permanently.

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.

Advantage .....

.....

.....

Disadvantage .....

.....

.....

.....

(5 marks)

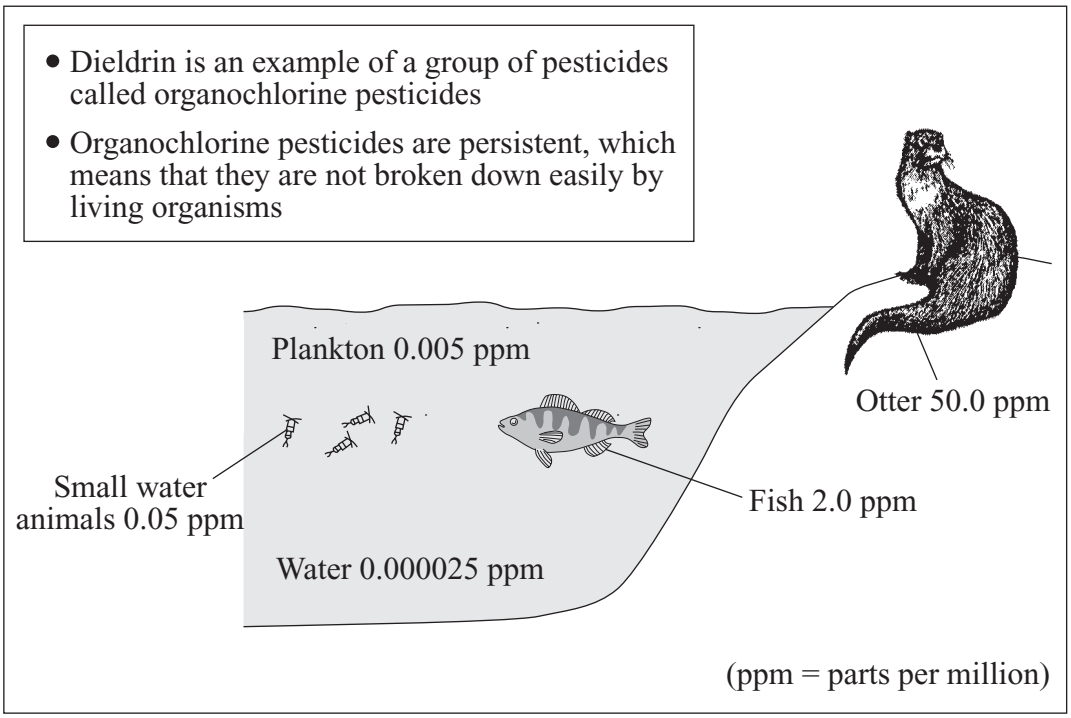
(ii) An area which is important for nature conservation is likely to be an SSSI. What do the letters SSSI stand for?

.....

(1 mark)

9

3 (a) In the 1950s and 1960s large amounts of the pesticide Dieldrin entered rivers and lakes in the United Kingdom. The diagram gives information about Dieldrin and the concentrations of the substance in water and in different organisms in a lake.



(i) Use information from the diagram to complete the food chain.

Plankton → Small water animals → ..... → .....

(1 mark)

(ii) In the 1950s otters were common in the United Kingdom. By 1970 they had disappeared from most places.
Suggest **one** reason why the otters had disappeared.

.....

.....

(1 mark)

(iii) Explain why Dieldrin was found at a much higher concentration in the otter than in the water in the lake.

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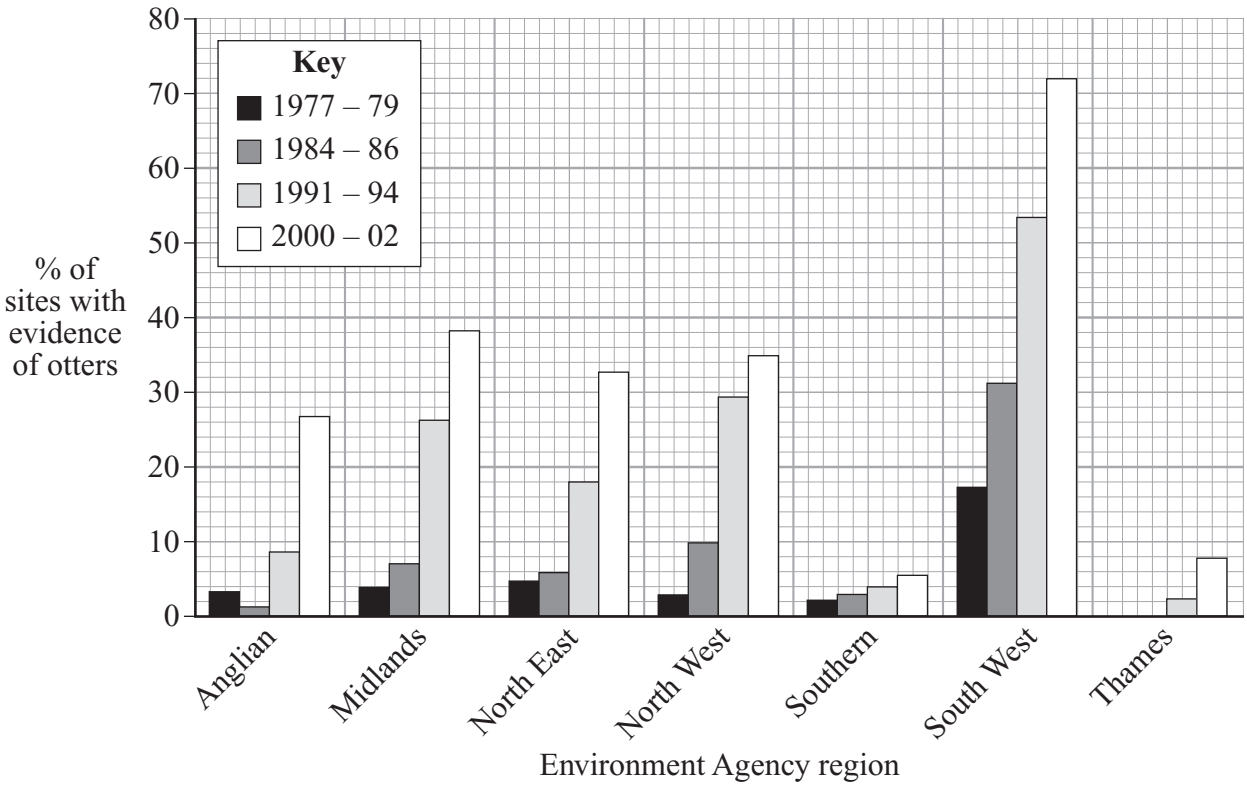
(2 marks)

(b) The chart shows the results of surveys of the otter population in England.



Source: data from: SIMON BINGHAM *www.environment-agency.gov.uk*

(i) State the trend shown by the chart.

.....

.....

(1 mark)

(ii) Organochlorine pesticides have been phased out of farming in the United Kingdom. They have mainly been replaced by pesticides which can be broken down in the environment.
Explain how this may have helped to cause the change shown in the chart.

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(2 marks)

Question 3 continues on the next page

(c) (i) Some people are against the use of chemical pesticides because of the way they harm wildlife.
Suggest **one** other reason why some people are against the use of these pesticides.

.....

(1 mark)

(ii) Some farmers do not use chemical pesticides or fertilisers on their land. What is this type of farming called?

.....

(1 mark)

(iii) State and explain **one** method which can be used to control pests without using chemical pesticides.

.....

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(2 marks)

11

Turn over for the next question

4 (a) The following paragraph describes some of the energy transformations in a wind power scheme.
Complete the paragraph by writing the names of **three** different types of energy in the spaces provided.

Energy from the sun is absorbed by the Earth's surface. ..... energy re-radiated from the Earth causes the air above to rise. This creates moving air currents which have ..... energy. Wind turbines drive generators which convert this energy into ..... energy.

(3 marks)

(b) State and explain **two** advantages of using wind power.

1 .....

.....

.....

2 .....

.....

.....

(4 marks)

(c) A group of students decided to test the following hypothesis:- "People who live close to a wind farm are likely to be against wind power."

(i) Suggest a method which the students could use to test this hypothesis.

.....

.....

(1 mark)

(ii) Explain **two** things which the students could do to help to make sure that their results are fair and reliable.

1.....

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2.....

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(4 marks)

12

Turn over for the next question

5 The photograph shows oil pollution in the sea near Alaska after an accident involving the ship Selendang Ayu in December 2004.

Source: Unalaska Community Broadcasting/Michael Edenfield via Associated Press

(a) (i) Shipping accidents can cause oil pollution of the sea.
State **two** other ways in which oil can enter the sea.

1.....

2.....

(2 marks)

(ii) Describe **one** way in which oil spills can harm living organisms.

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(2 marks)

(iii) Describe **one** way in which oil spills can damage the economy in the areas where they happen.

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(2 marks)

(b) (i) Describe **one** method which can be used to clean up oil which has been spilled into the sea.

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(2 marks)

(ii) Describe **one** method which can be used to make oil spills less likely to happen.

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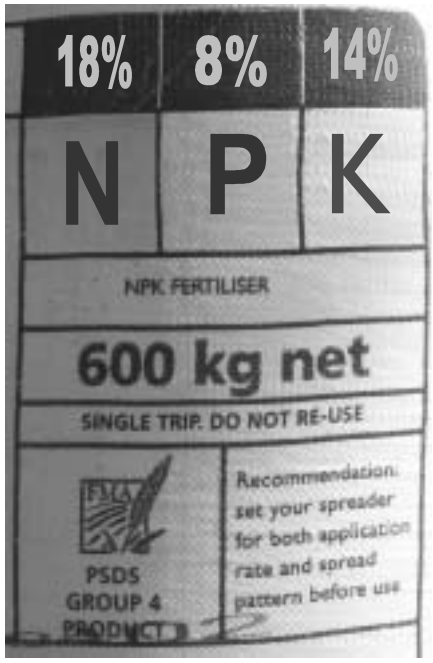
(2 marks)

10

Turn over for the next question

There are no questions printed on this page

6 (a) The photograph shows the information panel from a bag of fertiliser.



(i) The letter N represents the name of the chemical element nitrogen, which is one of the three most important plant nutrients.
Name the other **two** of these nutrients, which are represented by the letters P and K.

1.....

2.....

(2 marks)

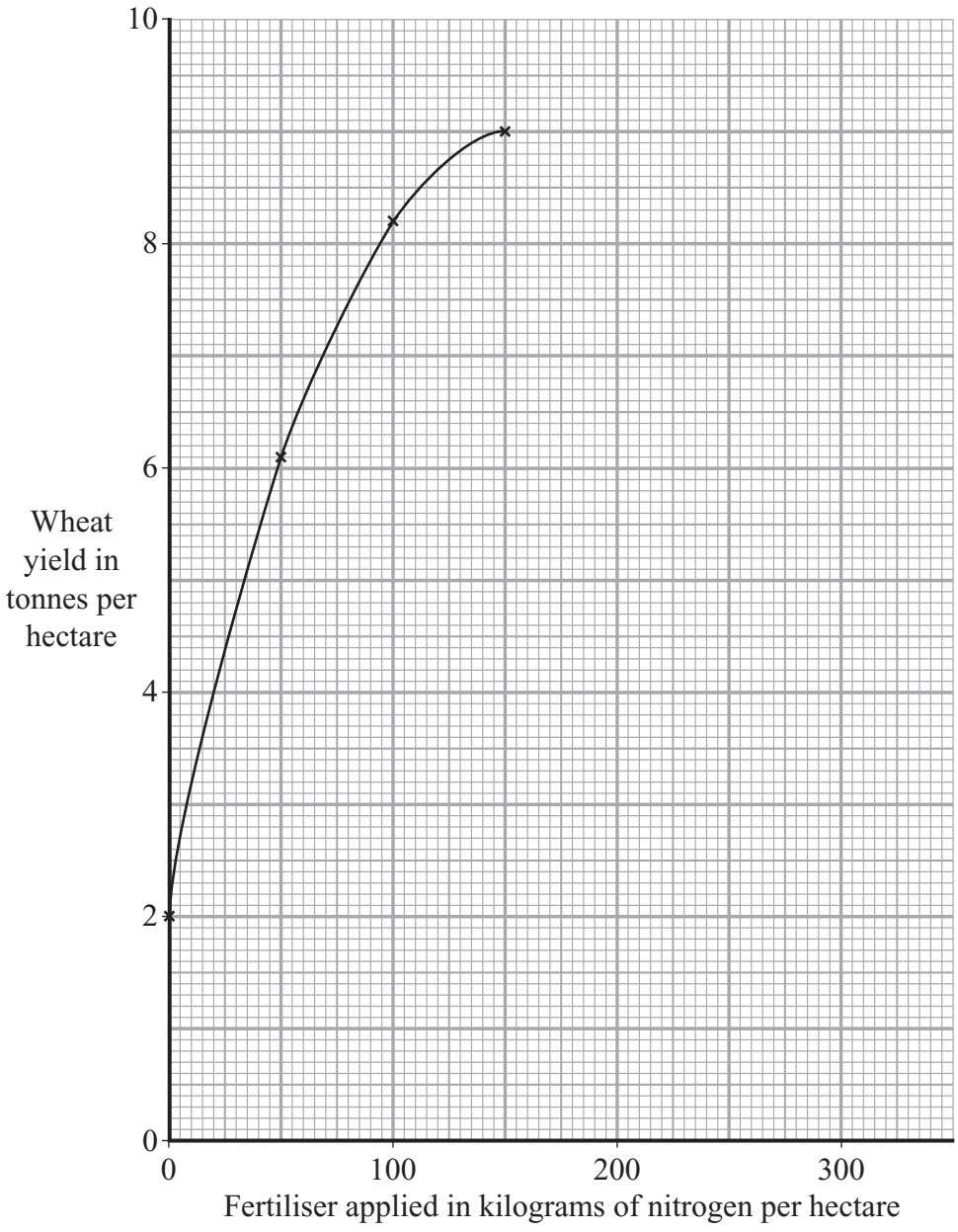
(ii) Use information from the photograph to help you calculate the mass of nitrogen contained in this bag of fertiliser.

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

Question 6 continues on the next page

(b) (i) Use figures from the table to complete the graph, which shows the effect of nitrogen fertiliser on the yield of wheat crops.

Fertiliser applied in kilograms per hectare	Wheat yield in tonnes per hectare
200	9.1
250	9.2
300	9.2



(2 marks)

(ii) Describe and explain the pattern shown by your completed graph.

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(4 marks)

(iii) You have to advise a farmer how much nitrogen fertilizer to use on a crop of wheat. Using evidence from the completed graph what application rate would you suggest? Explain your answer.

Suggested application rate ..... kilograms per hectare.

Explanation .....

.....

.....

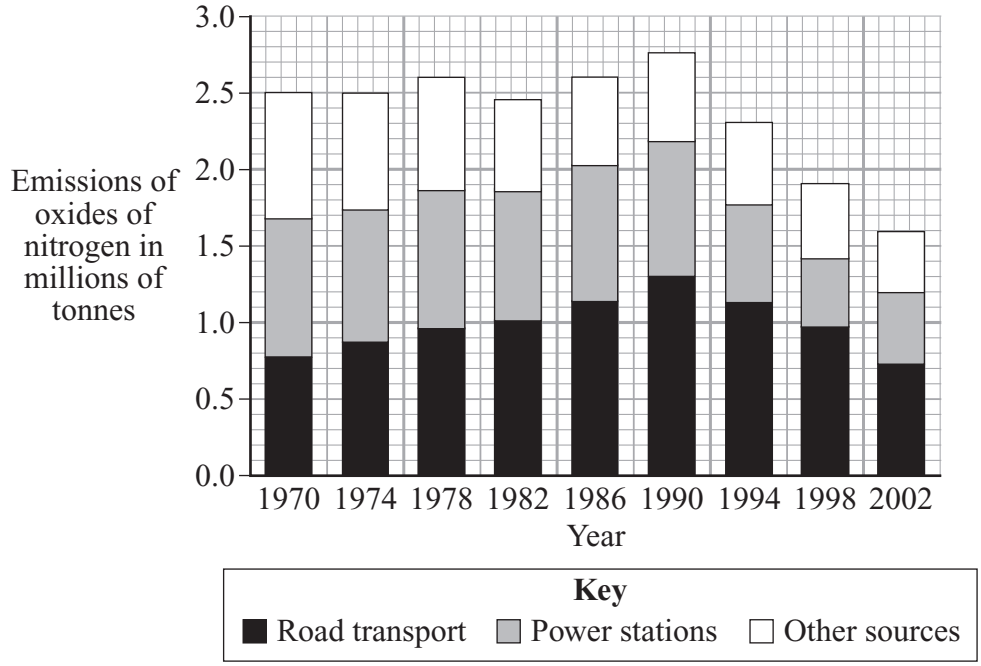
(3 marks)

12

Turn over for the next question

There are no questions printed on this page

7 The chart shows changes in the emissions of oxides of nitrogen (NO_x) into the atmosphere in the United Kingdom between 1970 and 2002.



(a) (i) Estimate the amount of NO_x emitted by road transport in 1970.

..... million tonnes *(1 mark)*

(ii) Estimate the total amount of NO_x emitted in 1990.

..... million tonnes *(1 mark)*

(iii) State **one** way in which the trends for the total amount of NO_x emitted and the trends for NO_x emitted by road transport between 1970 and 2002 are similar.

.....

.....

(1 mark)

(iv) State **one** difference between the trends for the total amount of NO_x emitted and the trends for NO_x emitted by road transport between 1970 and 2002.

.....

.....

.....

.....

(2 marks)

Question 7 continues on the next page

(v) A pollution control device which reduces NO_x emissions has been fitted to all new cars in the United Kingdom since 1992.
Name this device.

.....

(1 mark)

(b) (i) Describe **one** way in which emissions of oxides of nitrogen can damage the natural environment.

.....

.....

.....

.....

(2 marks)

(ii) Explain why oxides of nitrogen are sometimes called transboundary pollutants.

.....

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(2 marks)

(c) The box gives details about the Taj Mahal and about a change in transport policy in the area around it.

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Tel: 0161 953 1170

The Taj Mahal in Agra, India, is one of the world's most famous buildings. It was built in the seventeenth century by the Emperor Shah Jahan to commemorate his favourite wife, Mumtaz Mahal.

The Taj Mahal was mainly built of marble, a rock formed from limestone and mainly composed of calcium carbonate.

During the twentieth century people became very concerned that the Taj Mahal was being damaged by pollution from industry and motor vehicles.

In 1994 the Supreme Court of India imposed limits on the use of motor vehicles in a 4 km zone around the Taj Mahal. The government supported the Taj Mahal Cycle Taxi Improvement Project which led to the introduction of more efficient cycle rickshaws to transport people around the city.

Explain fully how the Taj Mahal Cycle Taxi Improvement Project would help to conserve the Taj Mahal.

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(4 marks)

14

Turn over for the next question

8 The box gives information about plans to farm cod in Scotland.

Environmentalists Fight Plans to Farm Cod in Scotland

Stricter fishing quotas have been imposed by the European Union to try to conserve cod. Cod stocks have been reduced by years of over-fishing. The fish farming industry hopes to take advantage of the situation by farming more cod. Fish farmers say that this will help to take pressure off stocks of wild cod.

Opponents of the fish farming industry, including environmental groups and anglers, see things rather differently. They are already worried about the environmental impact of salmon farming in northwest Scotland. They claim that production of cod and other new species will add to pollution in sea lochs (sheltered inlets along the coast).

Scientists have found that cod farming discharges 72.3 kilograms of nutrient nitrogen into the surrounding water for every tonne of production, compared with 48.2 kilograms per tonne for salmon. Fish farms also discharge large amounts of phosphates. In 2000, the Worldwide Fund for Nature estimated that Scotland's existing salmon farms produced the same amount of nitrogen as the sewage from 3.2 million people while phosphate deposits were equivalent to the sewage from 9.4 million people.

(a) State what is meant by the following words used in the first paragraph.

(i) *fishing quotas* .....

.....

.....

(1 mark)

(ii) *over-fishing*.....

.....

.....

(1 mark)

(b) (i) Explain **one** advantage of cod farming which is mentioned in the extract.

.....

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(2 marks)

(ii) State **one** other possible advantage of cod farming.

.....

.....

(1 mark)

(c) (i) Explain why environmentalists are worried about nutrients being discharged from fish farms.

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(2 marks)

(ii) State **two** other possible disadvantages of fish farming.

1.....

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2.....

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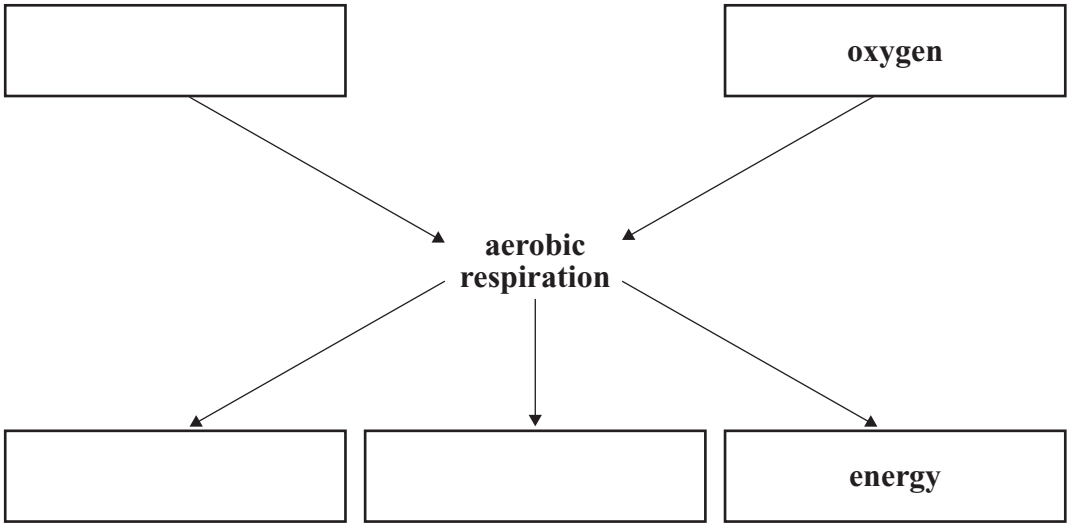
(2 marks)

9

Turn over for the next question

9 (a) Complete the diagram, which shows the process of aerobic respiration.



(3 marks)

(b) When fruit has been picked it often needs to be stored before being sold. Fresh fruit is still alive and so fruits continue to respire when they are stored. The table shows the respiration rate of cherries stored at different temperatures.

Storage temperature in ºC	**Respiration rate of cherries in ml of carbon dioxide per kg of fruit per hour**
0	4
5	7
10	16
20	26

(i) State the trend shown by the data in the table.

.....

(1 mark)

(ii) Cherries which are stored at 20 ºC quickly lose weight and become soft and wrinkled, but cherries stored at temperatures below 5 ºC stay firm and fresh for much longer.
Use information from the table to help you to explain **one** reason for this.

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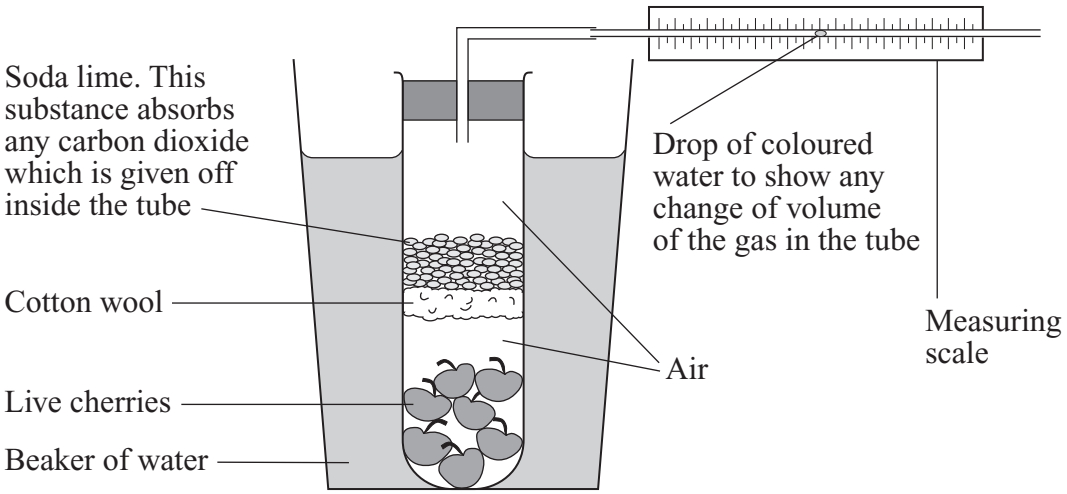
(2 marks)

(c) A group of students decided to compare the rate of respiration of cherries at different temperatures. The diagram shows the apparatus which they used.

If any carbon dioxide is produced in the tube it will be absorbed by the soda lime.

If any other gas is produced or absorbed by the cherries the volume of gas in the tube will change and the drop of coloured water will move inside the narrow tube. The amount of movement can be measured using the measuring scale.



(i) Add a horizontal arrow above the measuring scale on the diagram to show the direction in which you would expect the drop of coloured water to move if the cherries respire. *(1 mark)*

(ii) Explain why you would expect the drop of water to move in the direction you have shown in your answer to part (i).

.....

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.....

(2 marks)

Question 9 continues on the next page

(iii) Explain **two** things which the students would need to do to help to make sure that their results were fair and reliable.

1.....

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2.....

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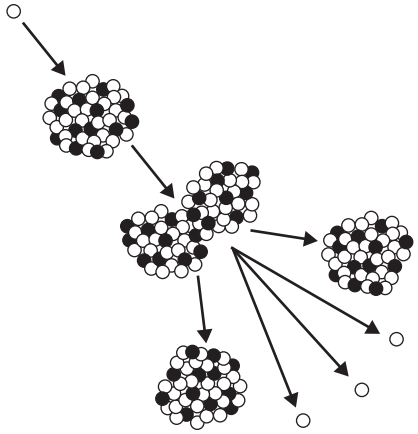
(4 marks)

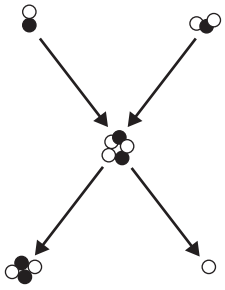
13

10 (a) Identify the types of nuclear reaction shown in these diagrams.

Reaction A



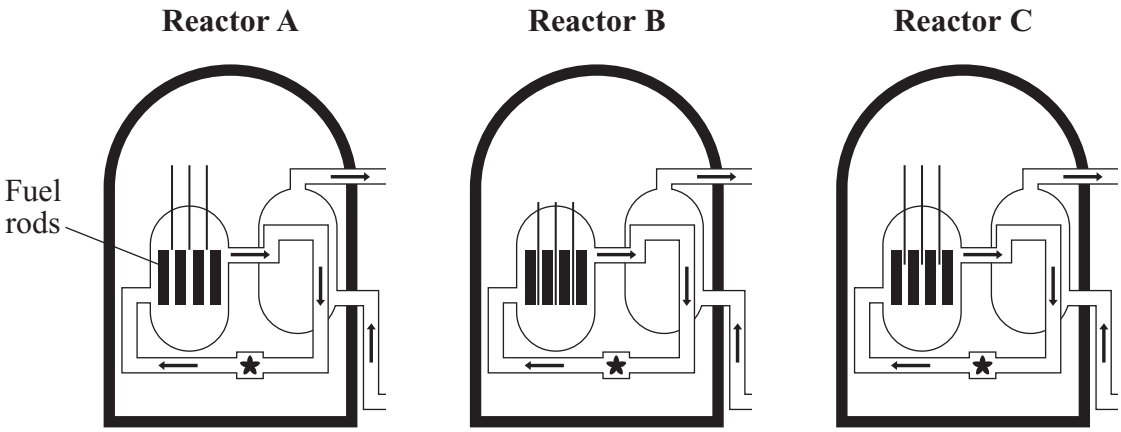
Reaction B



Reaction A ..... **Reaction B** .....

(2 marks)

(b) The diagrams show the cores of three nuclear reactors operating at different levels of energy output.



(i) Identify the reactor which is operating at the highest energy output.

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

(ii) Explain the choice you have made in part (i).

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.

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(3 marks)

Question 10 continues on the next page

(c) The box contains information about the nuclear power industry in the UK.

Sizewell B nuclear power station, with the North Sea in the background.

- The total amount of electricity used in the United Kingdom in 2003 was 379 terawatt hours.
- In 2003 nuclear power produced 81.9 terawatt hours of electricity in the United Kingdom.
- Sizewell B nuclear power station began producing electricity in 1995 and is not expected to close until 2035.
- Sizewell B produces an average of 8.5 terawatt hours of electricity each year.

Source of photo: Uranium Information Centre Ltd. *www.uic.com*

(i) Calculate the percentage of the electricity used in the United Kingdom in 2003 which was generated using nuclear power. Give your answer to the nearest whole number.

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

(ii) Calculate an estimate of the total amount of energy which will be produced by the Sizewell B power station during its planned lifetime. Assume that it continues to produce electricity at its present rate. Give your answer to the nearest whole number.

..... terawatt hours *(1 mark)*

(iii) Explain **one** reason why UK nuclear power stations such as Sizewell B are located on or very close to the coast.

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(2 marks)

(d) Explain the arguments for and against nuclear power.

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(8 marks)

18

END OF QUESTIONS

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