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	
10	
11	
12	
13	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
Specimen Paper

Environmental Science 44401F

Unit 1 Topics in Environmental Science

Date: XXXX

F

For this paper you must have:
- a ruler

You may use a calculator.

Time allowed
- 2 hours

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. Answers written in margins or on blank pages will not be marked.
- 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 120.
- You are expected to use a calculator where appropriate.
- In some questions you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

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

1 (a) Farmers apply different types of substances to their crops.

1 (a) (i) Use words from the box to complete the table.

disinfectants	**fertilisers**	**fossil fuels**	**pesticides**

	substances which provide nutrients needed by crops
	substances used to kill species which damage crops and reduce yields

(2 marks)

1 (a) (ii) Farming methods have changed in most parts of the world. Many of these changes are examples of intensification.

Which **one** of the following statements gives the meaning of the word *intensification*?

Tick (✓) the correct box.

using higher inputs to help produce higher yields of crops or animals ☐

breaking up the soil before planting seeds ☐

using larger areas of land to grow more crops and keep more animals ☐

(1 mark)

Barcode

1 (b) The table shows information about two different systems that farmers use to keep hens for egg production.

	Indoor laying cage system ('battery hens')	**Free-range system**
How hens are kept	Indoors in small cages	Free to move around inside and outside
Method of egg collection	Mechanised	By hand
Disease control	Easy	More difficult
Risk of predators	No risk	Some risk
Amount of food needed in grams of food / hen / day	106	132
Selling price of eggs (per dozen)	£1.02	£1.69

1 (b) (i) Which is the more intensive method of producing eggs?

Tick (✓) the correct box.

Laying cage system ☐

Free-range system ☐

No difference ☐

(1 mark)

1 (b) (ii) Suggest **one** reason why eggs produced by the laying cage system are cheaper than free-range eggs.

.....

.....

(1 mark)

Question 1 continues on the next page

1 (b) (iii) Many people buy free-range eggs even though they are more expensive.

Suggest **one** reason why they do this.

.....

.....

(1 mark)

1 (b) (iv) Imagine that you are in charge of publicity for a company which produces eggs from hens in laying cages.

State **two** points which you could make to persuade people that the laying cage system is better for the hens.

1 .....

.....

2 .....

.....

(2 marks)

1 (b) (v) Over the years farmers have chosen the best birds to produce the next generation of egg-laying hens.

Name this method of increasing production.

.....

(1 mark)

Barcode

1 (c) The box contains information about the Green Revolution and world food supplies.

- The Green Revolution has not helped many of the world's poorest people to have better lives
- Millions of people in Less Economically Developed Countries (LEDCs) still do not have enough food to eat.

1 (c) (i) What is meant by the phrase *Green Revolution*?

Tick (✓) the correct box.

when the government of a country is taken over by people who want to help the environment ☐

changes in farming methods, including growing improved varieties of crops ☐

growing different crops in different years in a field, so that the same nutrients are not used year after year ☐

(1 mark)

1 (c) (ii) State **one** reason why millions of people in LEDCs still do not have enough to eat.

.....

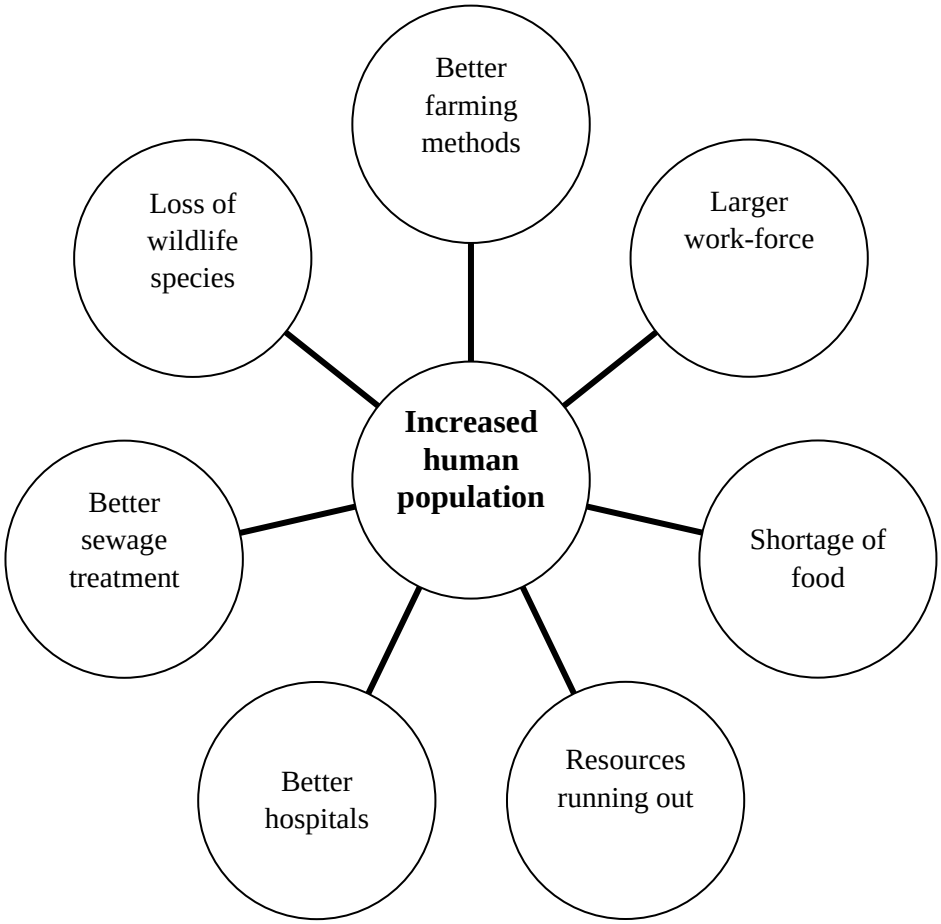
.....

(1 mark)

11

Turn over for the next question

2 (a) Population scientists identify the causes and effects of the increase in human population. Use the information in the diagram to answer the questions.



2 (a) (i) Give **two** causes of human population growth identified by the population scientists.

1 .....

2 .....

(2 marks)

2 (a) (ii) State **two** reasons why many population scientists are worried about the growth of the human population.

1 .....

.....

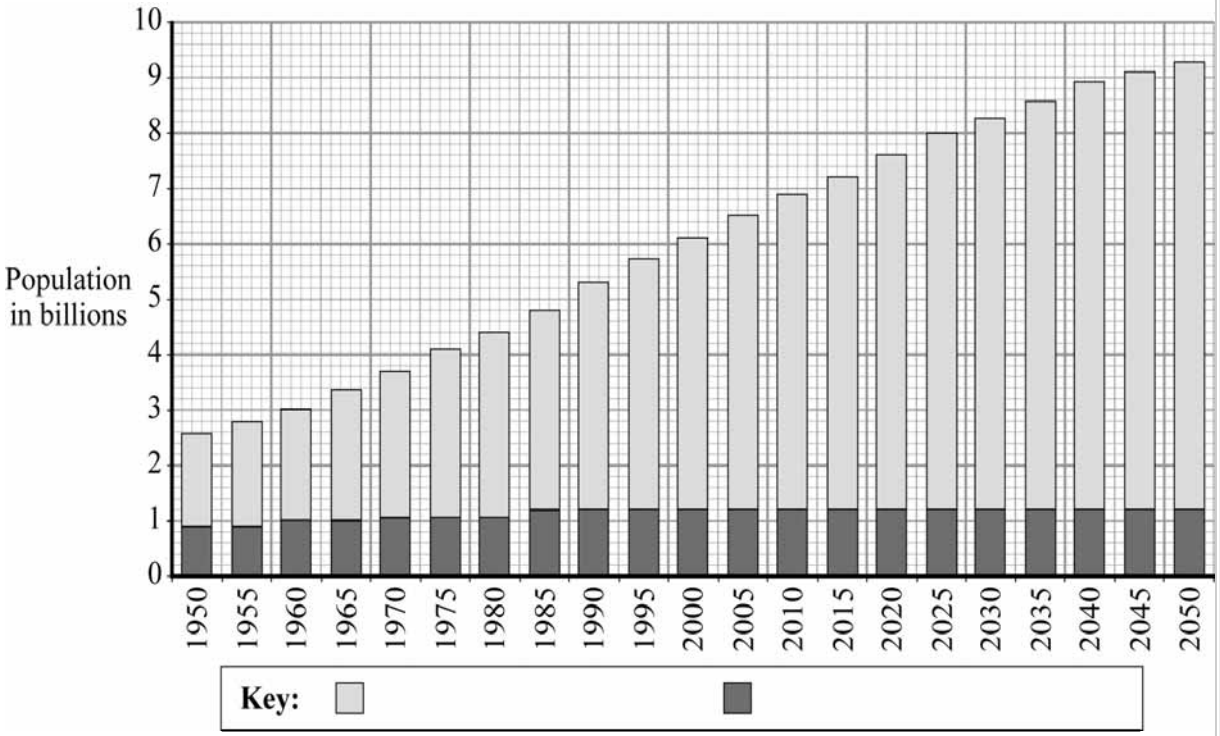
2 .....

.....

(2 marks)

Barcode

2 (b) Population scientists study the growth of human population and predict future trends.
The chart shows the growth and prediction of population in two different groups of countries over a 100 year period.



2 (b) (i) The labels in the key have been removed.

Which group of countries is represented by the dark shaded parts of the blocks?

Tick (✓) **one** box to show your answer.

Less economically developed countries (LEDCs) ☐

More economically developed countries (MEDCs) ☐

Whole world ☐

(1 mark)

2 (b) (ii) State **one** reason for the choice you made in part (b)(i).

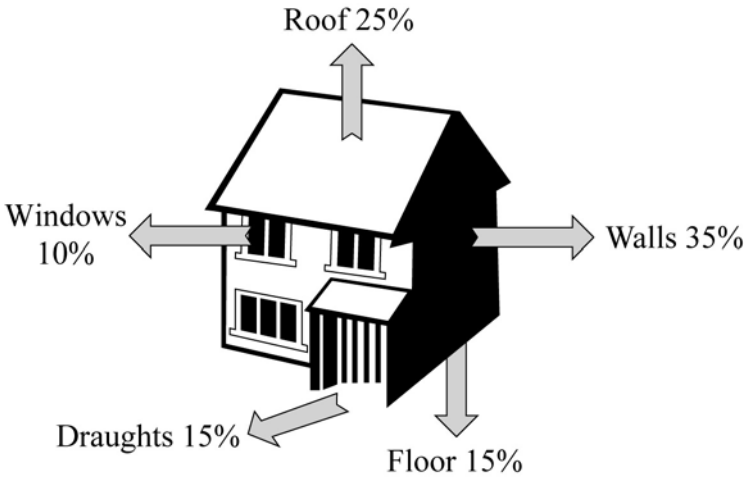
.....

.....

(1 mark)

6

3 (a) An energy consultant calculated the percentage heat loss from a house. This is shown in the diagram.



3 (a) (i) Which part of the house loses most heat?

.....

(1 mark)

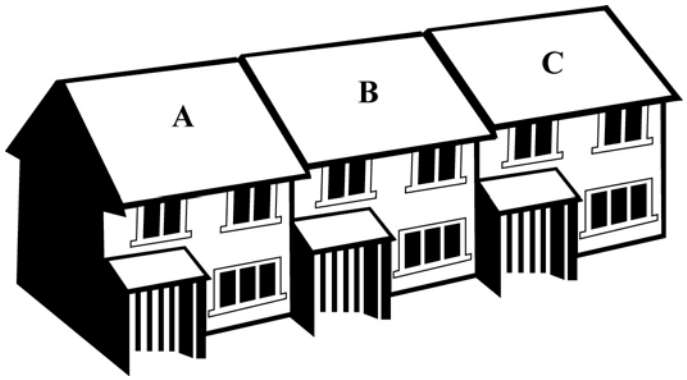
3 (a) (ii) State **two** methods of reducing heat loss from the house.

1 .....

2 .....

(2 marks)

3 (a) (iii) The sketch shows a row of three similar houses. The energy consultant calculated that one would be less expensive to heat than the other two.



Which house would be the least expensive to heat?

.....

(*1 mark*)

Barcode

3 (a) (iv) State **one** reason for your choice in part (a)(iii).

.....

.....

(1 mark)

3 (b) Suggest **two** lifestyle changes which the energy consultant may suggest to help a family to reduce the amount of energy they use in their day-to-day life.

1 .....

.....

2 .....

.....

(2 marks)

7

Turn over for the next question

4 Some environmental scientists suggest that nuclear power is a possible alternative to the use of fossil fuels.

4 (a) Use words from the box to complete the paragraph below.

fission	**fusion**	**generators**	**graphite**
turbines	**uranium**	**valves**	**wheels**

Commercial nuclear power stations use fuels containing plutonium or

…….... They make heat by nuclear……..

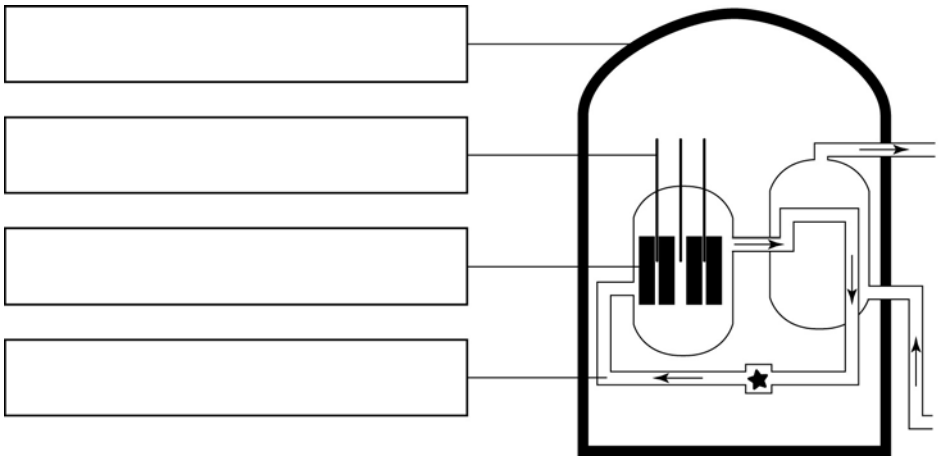
The heat is used to produce steam which is used to turn…….

These are connected to……...which produce the electricity.

(4 marks)

4 (b) The diagram shows a nuclear reactor.
Choose words from the box to complete the labels.
Write your answers in the spaces provided.

containment	**control rod**	**coolant**	**fuel rod**	**valve**



(4 marks)

Barcode

4 (c) State **two** advantages of using nuclear power rather than fossil fuels that the environmental scientists may suggest.

1 .....

.....

2 .....

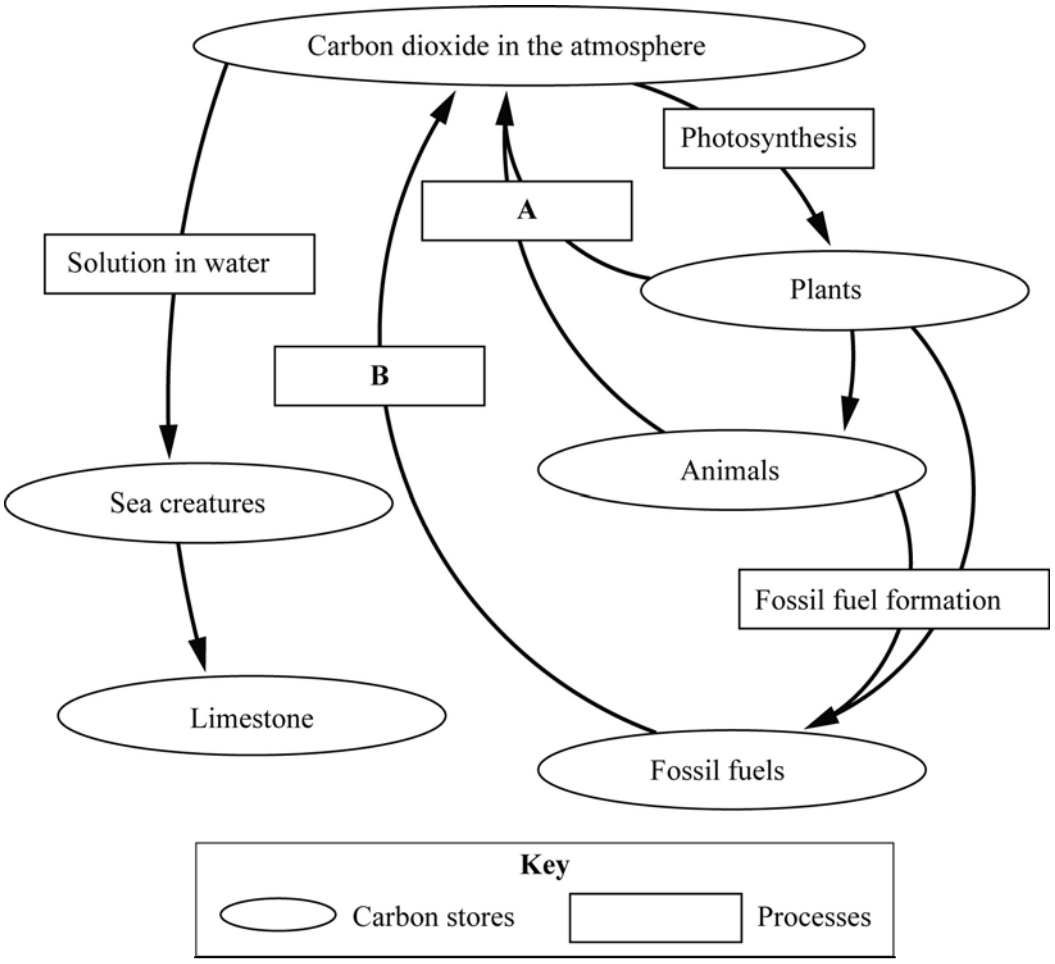
.....

(2 marks)

10

Turn over for the next question

5 Environmental scientists are worried about the amount of carbon dioxide in the atmosphere. The diagram shows some of the stores and processes in the carbon cycle.



5 (a) (i) Name **two** processes which remove carbon dioxide from the atmosphere.

1 .....

2 .....

(2 marks)

5 (a) (ii) Identify process **A**. Draw a ring around the correct answer.

Absorption **Digestion** **Respiration**

(1 mark)

5 (a) (iii) Name process **B**.

.....

(1 mark)

Barcode

5 (b) (i) Tick (✓) **one** box to show the statement which best completes the following sentence.

Most environmental scientists are worried about the amount of carbon dioxide in the atmosphere because:

soon there will not be enough oxygen in the atmosphere ☐

increased amounts of carbon dioxide in the atmosphere are likely to cause climate change ☐

carbon dioxide is extremely poisonous. ☐

(1 mark)

5 (b) (ii) Tick (✓) **one** box to show the statement which best completes the following sentence.

The total amount of carbon dioxide, and other greenhouse gases, emitted over the full life cycle of a product, service or event is called the:

carbon footprint ☐

carbon total ☐

greenhouse potential. ☐

(1 mark)

5 (c) (i) Environmental scientists have suggested that planting more trees will help to remove carbon dioxide from the atmosphere.

State **one** reason why this suggestion might work. Use information from the diagram to help you.

.....

.....

(1 mark)

5 (c) (ii) State **one** reason why planting trees may not remove the carbon dioxide from the atmosphere for very long.

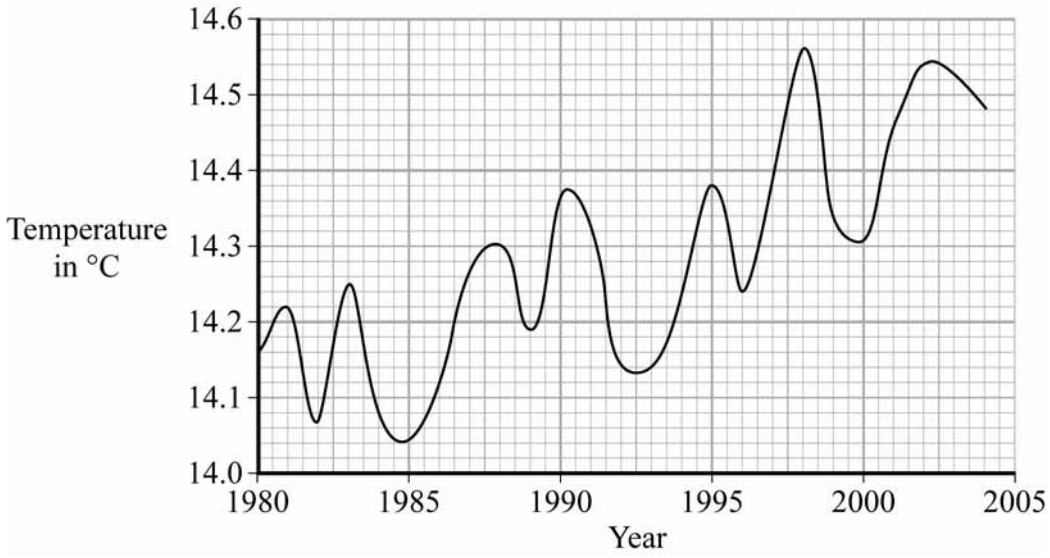
.....

.....

(1 mark)

8

6 Scientists monitor the average temperature of the Earths surface. They use this information to help predict future changes.
The graph shows the changes in the average temperature of the Earth's surface between 1980 and 2004.



6 (a) In which year did the Earth's average temperature first reach 14.3 °C?

.....

(1 mark)

6 (b) Draw a straight line on the graph to show the overall trend in the Earth's average temperature between 1980 and 2004.

(1 mark)

6 (c) Describe the pattern of change shown by the graph.

.....

.....

.....

(2 marks)

Barcode

6 (d) Forty years ago many scientists believed that the Earth might be heading towards another Ice Age, with much colder temperatures than we experience now.

Which of the following statement best sums up what the graph shows about this idea?

Tick (✓) **one** box.

The graph shows no information about the Earth's climate. ☐

The graph seems to suggest that the Earth is heading towards another Ice Age. ☐

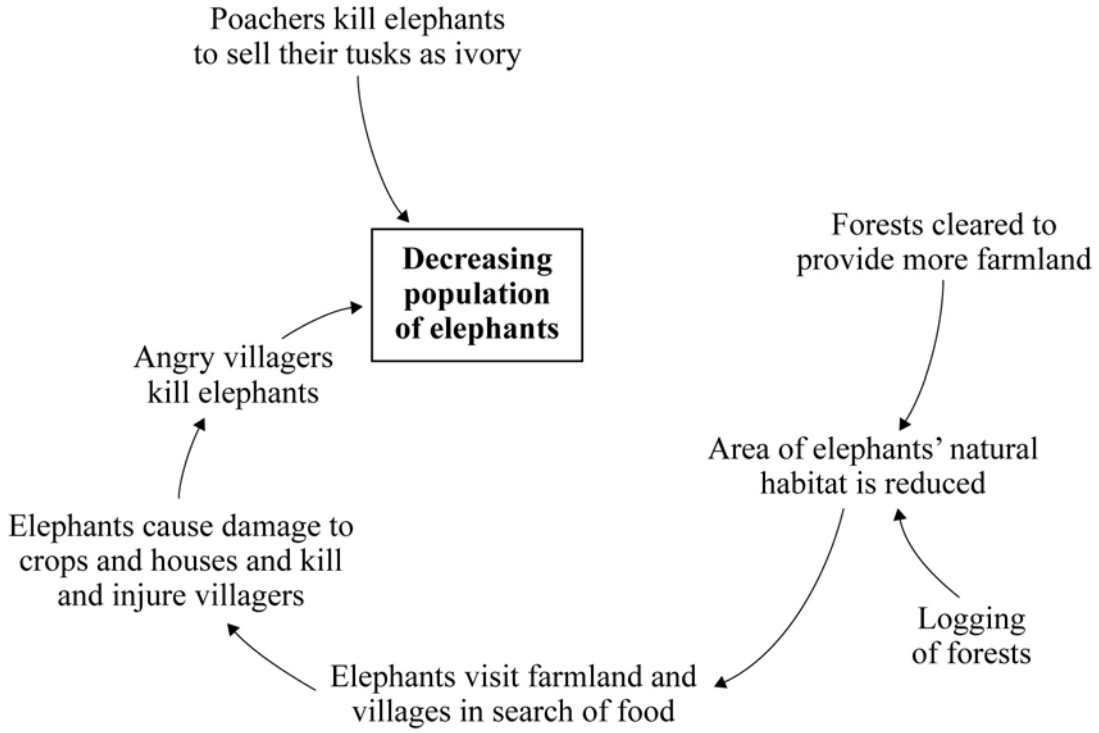
The graph seems to suggest that it is unlikely that the Earth is heading towards another Ice Age. ☐

(1 mark)

5

Turn over for the next question

7 (a) Wildlife conservationists are concerned about the decrease in the elephant population in Sri Lanka. The diagram shows some of the reasons for this decrease. Use information from the diagram to help you answer the following questions.



7 (a) (i) State **one** way in which people in Sri Lanka can make money by killing elephants.

.....

.....

(1 mark)

7 (a) (ii) State **two** reasons why there is less natural habitat for the elephants.

1 .....

.....

2 .....

.....

(2 marks)

Barcode

7 (a) (iii) State **one** reason why villagers become angry with elephants.

.....

.....

(1 mark)

7 (a) (iv) Elephants will not cross electric fences. The wildlife conservationists have suggested putting electric fences around villages and fields in Sri Lanka. Explain why this would help to conserve the elephants.

.....

.....

.....

.....

(2 marks)

7 (a) (v) The wildlife conservationists are keen to help the local people earn money from the elephants without harming them. Suggest **one** way in which local people could earn money from elephants which are allowed to live in the wild near their villages.

.....

.....

(1 mark)

7 (b) (i) CITES is an international conservation agreement.

Tick (✓) **one** box to show what the abbreviation CITES stands for.

Charter to Improve The Elephants' Security ☐

Convention on International Trade in Endangered Species ☐

Convention on International Trade in Extinct Species ☐

(1 mark)

7 (b) (ii) Suggest **one** way in which conservationists working in zoos could help to increase the numbers of endangered species such as elephants living in the wild.

.....

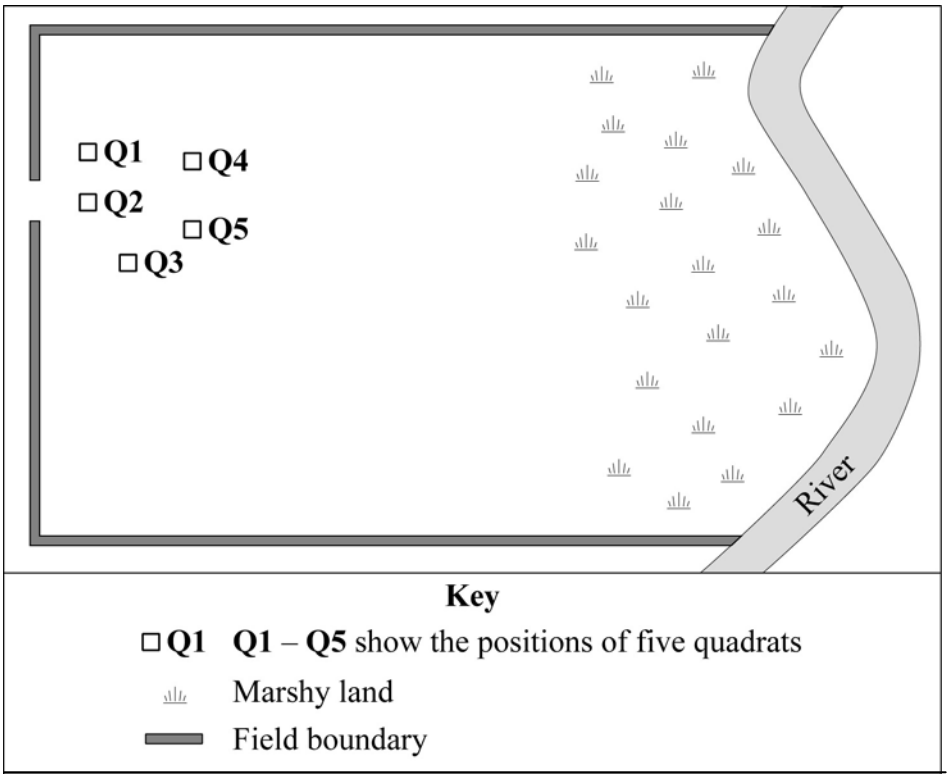
.....

(1 mark)

9

8 (a) The fritillary is a rare flowering plant which grows in parts of the United Kingdom.
The sketch map shows a large field which has fritillary plants growing in it.
The map is not drawn to scale.

The owners of the field counted the number of fritillary plants in each of the five quadrats shown on the map. They used these results to estimate the total number of plants in the field.



Quadrat number	Number of fritillary plants
Q1	0
Q2	3
Q3	2
Q4	5
Q5	5

8 (a) (i) Calculate the total number of fritillary plants which were found.

.....

(1 mark)

8 (a) (ii) Calculate the mean number of fritillary plants per quadrat.

.....

(1 mark)

8 (a) (iii) Each of the quadrats was 1 m^2 in area. The total area of the field was 120 000 m^2.
Use this information, together with your answer to part (a)(ii), to calculate the owners' estimate of the total number of fritillary plants in the field.

.....

(1 mark)

8 (a) (iv) Suggest **two** reasons why the owners' estimate may not be reliable.

1 .....

.....

2 .....

.....

(2 marks)

8 (b) (i) Name **one** government organisation which is responsible for nature conservation in the United Kingdom.

.....

(1 mark)

8 (b) (ii) Name one non-governmental wildlife conservation organisation in the United Kingdom.

.....

(1 mark)

Question 8 continues on the next page

8 (b) (iii) Suggest and explain why many people believe that it is important to conserve wildlife species and habitats.
In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

.....

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.....

(4 marks)

11

9 Read the following extract from the diary of a group of students on a walking holiday in the Lake District in northern England.

JULY
Thursday 25th

Rain again – the Lake District really is the wettest place in England! Water running everywhere over the hard rocks (and down our necks).

Today we walked past Haweswater Reservoir in its steep-sided valley. It used to be a much smaller natural lake with a village at one end but then in the 1940s Manchester Corporation built a dam to create a larger lake to supply water to Manchester. The village of Mardale Head and the surrounding land were submerged.

Barcode

9 (a) The extract mentions **three** factors which helped the students decide that the Lake District is a good place to build water supply reservoirs. Identify these factors.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

9 (b) State **two** reasons why the students think that the local people may have been against the building of this reservoir.

1 .....

.....

2 .....

.....

(2 marks)

9 (c) The students notice that the water supply reservoirs can be used for other purposes as well.
Suggest **two** possible additional uses for a reservoir like the one described in the extract.

1 .....

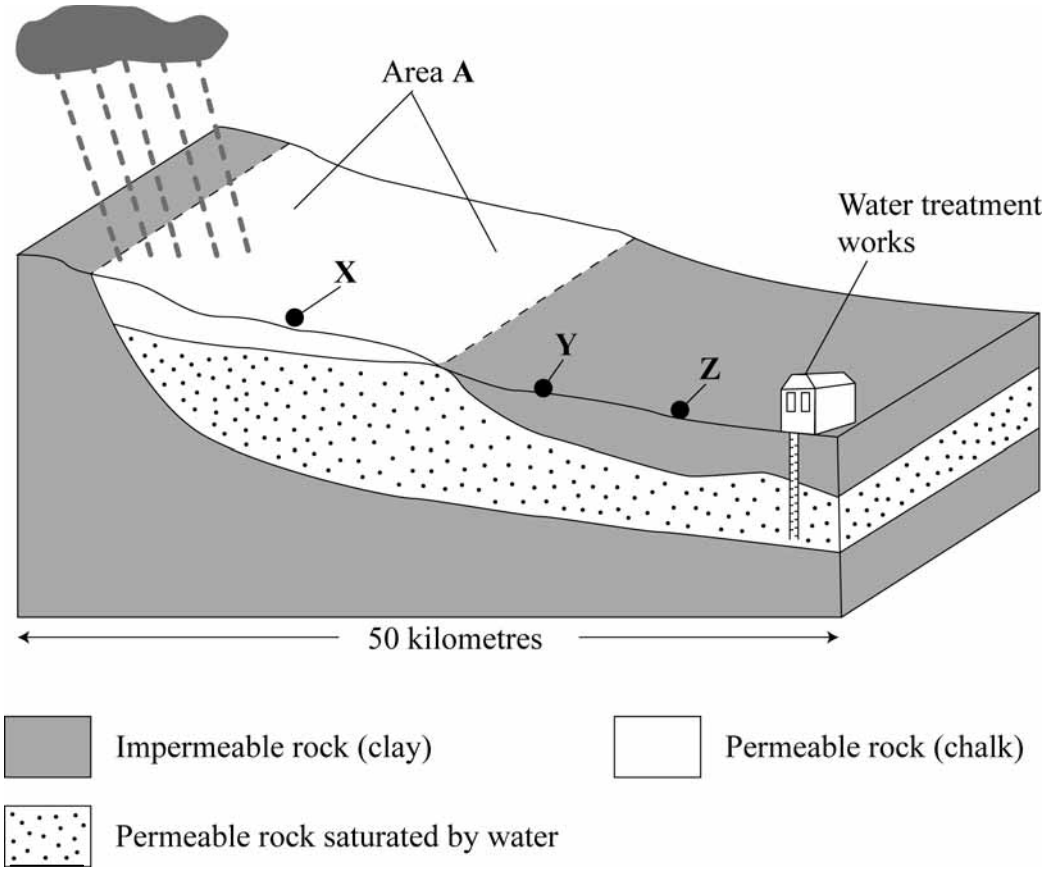
2 .....

(2 marks)

7

Turn over for the next question

10 A water engineer identified an area with a layer of underground rock containing water which could be used as a source of drinking water.



10 (a) What is the name for an underground layer of rock which could be used as a source of drinking water?

.....

(1 mark)

10 (b) The water engineer normally treats water in several stages to make it clean and safe.

Tick (✓) **one** box to show which of the following lists shows the stages of water treatment in the correct order.

Screening → Clarification → Disinfection → Filtration ☐

Filtration → Screening → Disinfection → Clarification ☐

Screening → Clarification → Filtration → Disinfection ☐

(1 mark)

Barcode

10 (c) The water engineer found that the water from the underground source needed less treatment than water from rivers or reservoirs.

Draw a ring around **one** stage of the water treatment process which is not likely to be needed at the water treatment works shown on the diagram.
State **one** reason for your choice.

Clarification **Disinfection** **Filtration** **Screening**

Reason .....

.....

(2 marks)

10 (d) It was planned to build a chemical factory at either **X**, **Y** or **Z**.
Which place, **X**, **Y** or **Z**, would the company which runs the water treatment works be most strongly against? Give **one** reason for your answer.

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

Reason .....

.....

.....

(2 marks)

Question 10 continues on the next page

10 (e) Local farmers were told that there were legal limits on the type of farming in the unshaded area of land (Area **A)**.

Draw a ring around the activity which is most likely to be limited in this area and state **one** reason for your choice.

ploughing **using fertilisers** **grazing sheep**

Reason .....

.....

.....

(2 marks)

10 (f) Which organisation was responsible for telling the local farmer about the limits to farming?

Tick (✓) the correct box.

English Heritage ☐

Environment Agency ☐

Water Resources Authority ☐

(1 mark)

9

Barcode

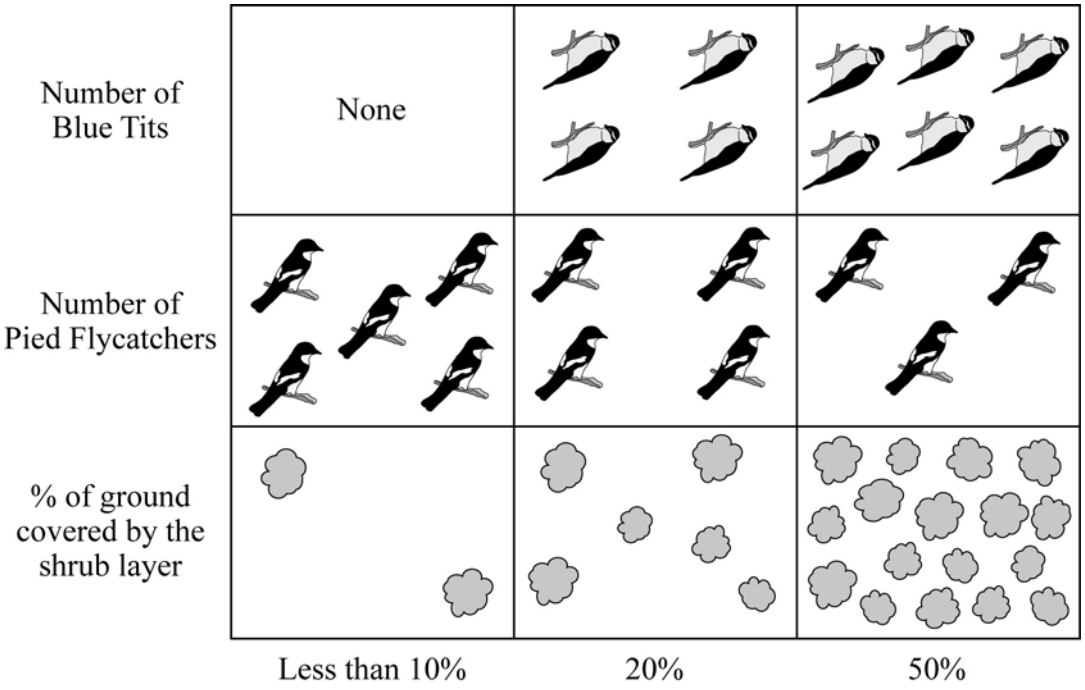
Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

11 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.

Environmental scientists chose areas of woodland with different amounts of ground covered by the shrub layer and counted the numbers of birds in each area.

The chart shows the results of an investigation into the relationship between the percentage cover of the shrub layer and the numbers of these birds.



11 (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)

11 (a) (ii) Identify the independent variable in this investigation.

.....

(1 mark)

11 (a) (iii) Identify **one** dependent variable in this investigation.

.....

(1 mark)

Barcode

11 (a) (iv) Identify **one** control variable which the environmental scientists would have had to consider when carrying out this investigation.
State **one** reason why this variable might affect the results of the investigation.

Control variable.....

.....

Reason .....

.....

(2 marks)

11 (a) (v) The environmental scientists found, in a survey of an area of woodland, that 50 % of the ground was covered by the shrub layer. There were 46 Pied Flycatchers. How many Blue Tits would you expect to find in the same area?

.....

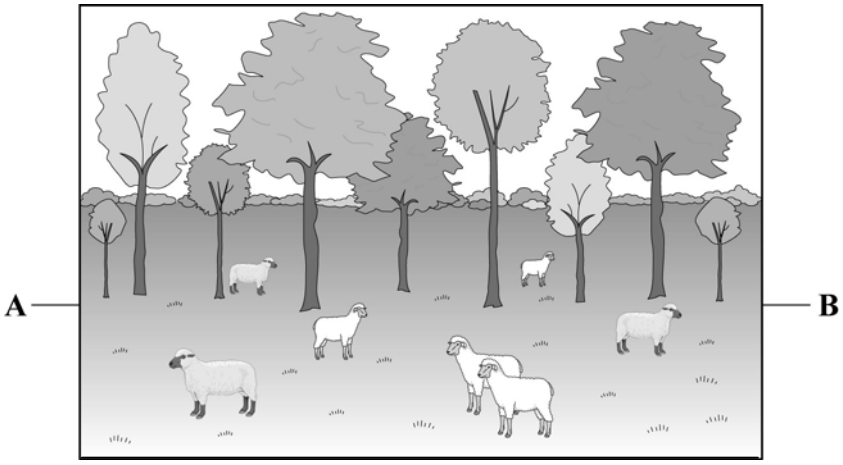
(1 mark)

Question 11 continues on the next page

11 (b) There are large numbers of Blue Tits in most parts of the United Kingdom. Pied Flycatchers are much less common.

The sketch shows part of a nature reserve where the wardens want to encourage Pied Flycatchers to live and breed.

At present sheep are allowed to graze under the trees. They eat grass but also nibble away any young shrubs and trees which begin to grow.



11 (b) (i) In their management plan, the reserve wardens have suggested keeping sheep out of the woodland by building a fence from **A** to **B**. Explain why they think that this will help to increase the number of Pied Flycatchers.

.....

.....

.....

.....

(2 marks)

Barcode

11 (b) (ii) A rare plant grows in the grassland area in front of the trees.
Explain why the wardens have decided to build the fence rather than removing the sheep from the whole area.

.....

.....

.....

.....

(2 marks)

11 (c) Nature reserves often have car parks, toilets, picnic areas and sometimes shops for visitors.
Suggest **one** other facility which is likely to be provided. State **one** reason for the facility you have suggested.

Facility provided.....

.....

Reason .....

.....

(2 marks)

12

Turn over for the next question

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Barcode

12 (a) The table gives some details about two types of energy resource.

Energy resource	Is it predictable?	Is it intermittent?
Tidal power	Yes	Yes
Wind power		

12 (a) (i) Complete the table by writing either Yes or No in the correct boxes to show the characteristics of wind power.

(1 mark)

12 (a) (ii) State **two** reasons why some environmentalists are against the building of turbines to harness wind power.

1 .....

.....

2 .....

.....

(2 marks)

12 (a) (iii) State and explain why many environmental scientists believe that it is better to obtain energy from wind power rather than by using fossil fuels.
In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

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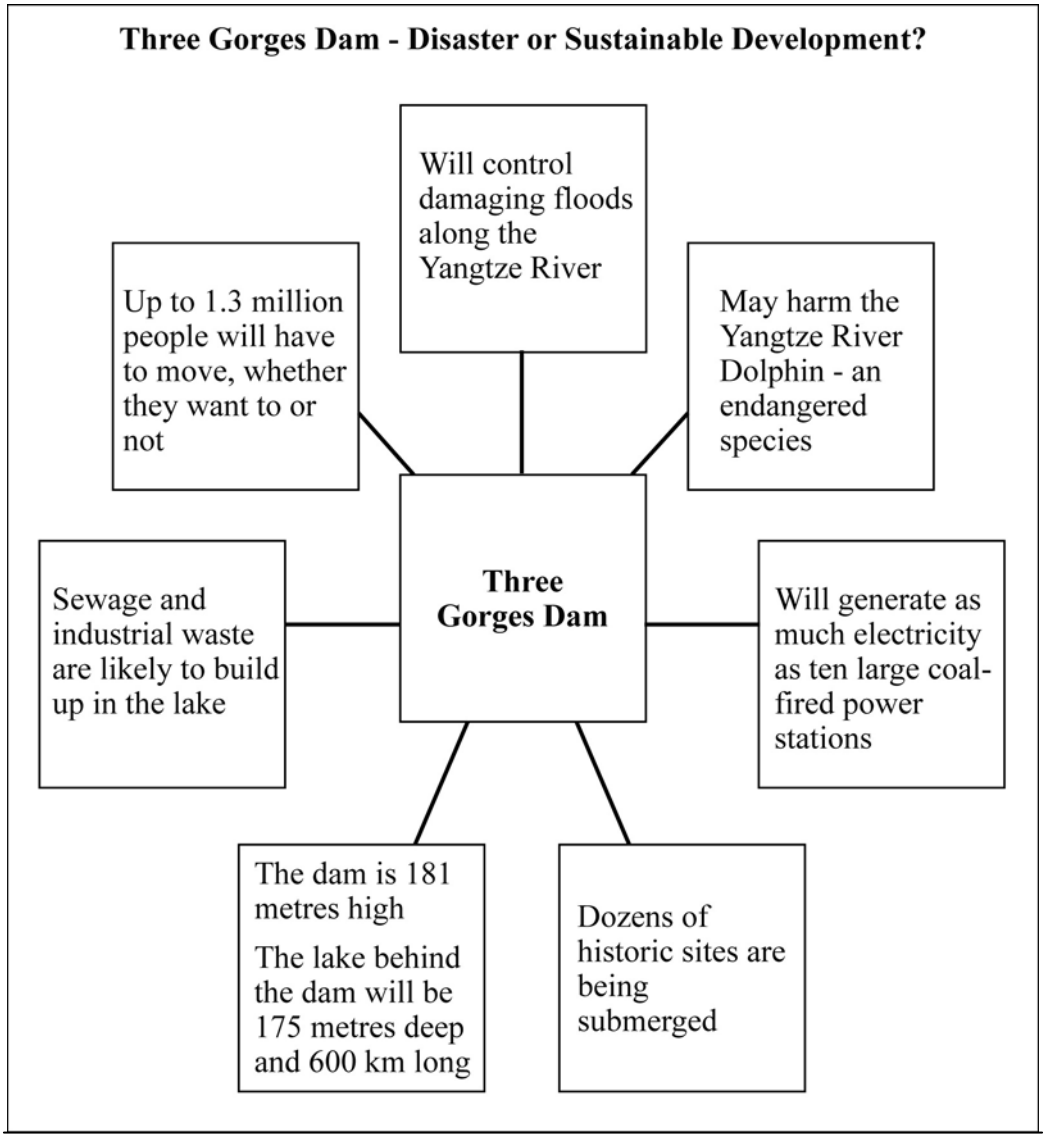
.....

(4 marks)

12 (b) The Three Gorge Dam is a hydroelectric river dam on theYangtze River in China. Environmental scientists have argued about the costs and benefits of the project which will be the largest HE power station in the world.
Use the information to answer the questions.



12 (b) (i) What do environmental scientists mean by the phrase *sustainable development*?

.....

.....

.....

.....

(2 marks)

Barcode

12 (b) (ii) Explain **one** possible reason why some environmental scientists believe that the Three Gorges Dam is an example of sustainable development.

.....

.....

.....

.....

(2 marks)

12 (b) (iii) Explain **one** possible reason why some environmental scientists believe that the Three Gorges Dam is **not** an example of sustainable development.

.....

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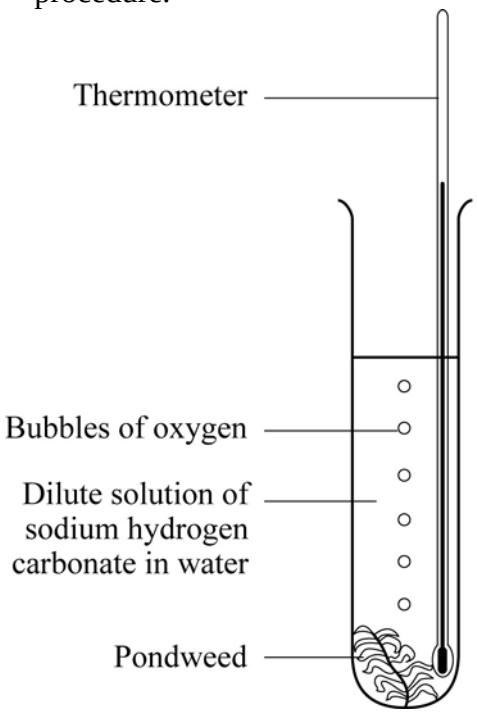
(2 marks)

13

Turn over for the next question

13 (a) Some students investigated the rate of photosynthesis at different temperatures. The diagram shows the apparatus they used. The box gives details of their procedure.



- The students set up a number of tubes like this one.
- Each tube was kept at a different temperature.
- To measure the rate of photosynthesis they counted the number of bubbles given off in five minutes.
- They used these results to calculate the number of bubbles per minute.

13 (a) (i) State **one** action which the students should take to help to make sure that they carried out a fair test. State **one** reason for your answer.

Action .....

.....

Reason .....

.....

(2 marks)

13 (a) (ii) State **one** thing which the students could do to check the reliability of their results.

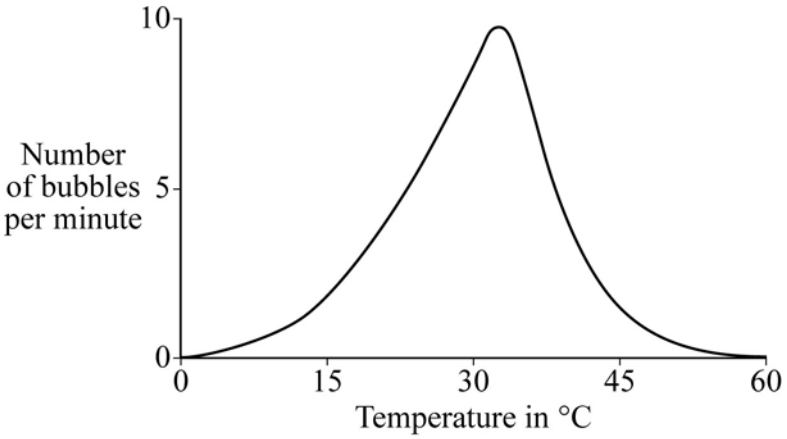
.....

.....

(1 mark)

Barcode

13 (a) (iii) The diagram shows a sketch graph of the students' results.



Describe fully the pattern shown by the graph.

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.....

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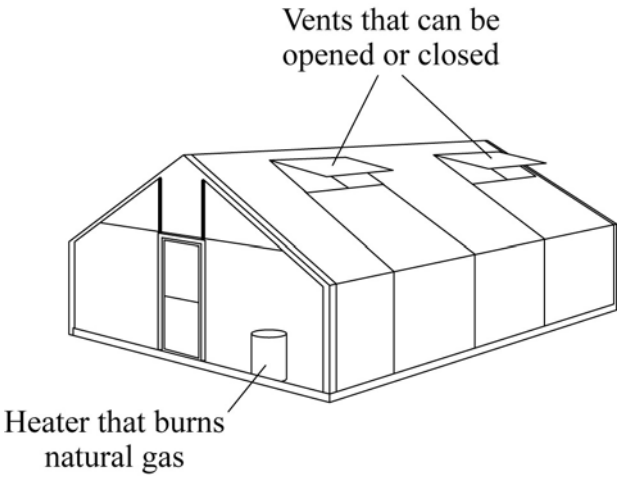
(3 marks)

Question 13 continues on the next page

13 (b) The diagram shows a glasshouse used to grow crops.



13 (b) (i) Explain how use of the vents can help to increase the yield of crops in this glasshouse.

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.....

.....

.....

(3 marks)

13 (b) (ii) State **two** ways in which the heater can help to increase the yield of crops in this glasshouse.

1 .....

.....

2 .....

.....

(2 marks)

Barcode

13 (b) (iii) A glasshouse is a controlled environment.

State **one** other example of the use of a controlled environment in farming.

.....

.....

(1 mark)

12

END OF QUESTIONS

There are no questions printed on this page

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