Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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4	
5	
6	
7	
8	
9	
10	
TOTAL	

General Certificate of Education
Advanced Level Examination
June 2013

Human Biology HBIO5

Unit 5 The air we breathe, the water we drink, the food we eat

Monday 17 June 2013 1.30 pm to 3.30 pm

For this paper you must have:
- a ruler with millimetre measurements
- 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. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific terminology accurately.

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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

1 (a) Name the organelle in which an electron transfer chain is found in photosynthesis.

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(1 mark)

1 (b) One of the products of the light-dependent stage of photosynthesis is oxygen.
Name **two** other products of the light-dependent stage.

1 .....

2 .....

(2 marks)

1 (c) (i) What is the function of oxygen in respiration?

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(1 mark)

1 (c) (ii) Without oxygen, less ATP is produced in respiration.
Explain why.

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(2 marks)

6

2 A microbiologist isolated samples of the bacterium *Staphylococcus aureus* from the noses of two people, **A** and **B**. He added samples of the bacteria from each person to separate tubes. Each tube contained a liquid culture medium with a different antibiotic.

At first, the liquid in the tubes was clear but after 24 hours incubation the liquid in some of the tubes had become cloudy. The cloudiness was due to the presence of large numbers of bacteria.

The results are shown in **Table 1**.

Table 1

	Antibiotic in liquid culture medium		
	Ampicillin	**Methicillin**	**Vancomycin**
Appearance of liquid in tube with bacteria from person **A**	Clear	Clear	Clear
Appearance of liquid in tube with bacteria from person **B**	Cloudy	Cloudy	Clear

2 (a) (i) Explain the results for the tubes containing the samples from person **A**.

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(2 marks)

2 (a) (ii) The microbiologist set up a control tube for each experiment.
What would each control tube contain?

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(1 mark)

2 (b) One person worked in a hospital, the other worked in an office. Suggest whether person **A** or person **B** worked in the hospital.
Explain your choice.

Person .....

Reason for choice .....

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(2 marks)

5

Turn over for the next question

3 (a) A person's carbon footprint is the amount of greenhouse gases the person's activities produce. It is made up of a primary contribution and a secondary contribution. What is meant by the primary and secondary contribution?

The primary contribution .....

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The secondary contribution .....

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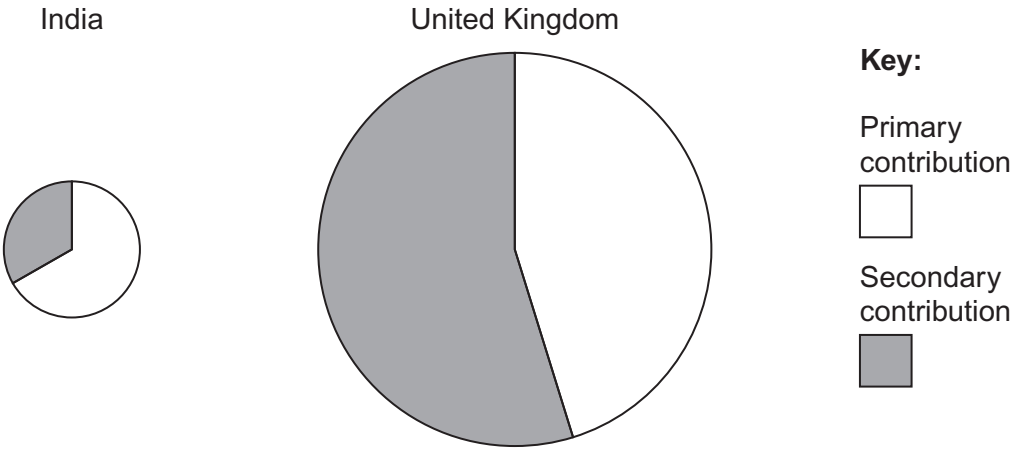
(1 mark)

3 (b) **Figure 1** shows the carbon footprint of a typical person in India and a typical person in the United Kingdom.

Figure 1



Total = 1020 Total = 9805

kg of carbon dioxide produced per year

Use the information in **Figure 1** to describe **two** ways in which the carbon footprints are different.

1 .....

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2 .....

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(2 marks)

3 (c) Some companies operate *carbon-offset schemes* to reduce their carbon footprint. These schemes involve the planting of trees.
Explain how the planting of trees can reduce a company's carbon footprint.

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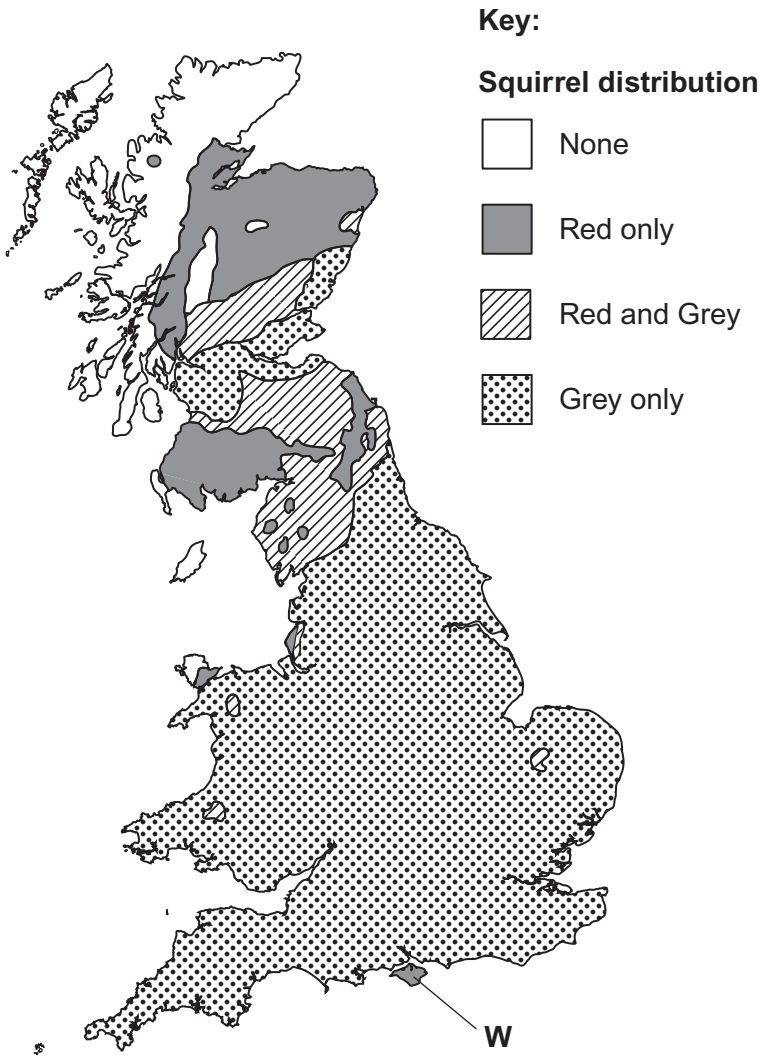
(2 marks)

5

Turn over for the next question

4 (a) About one hundred years ago, red squirrels were the only species of squirrel found in the wild in Britain. They were found in most parts of Britain. Grey squirrels are a different species and are from North America. Early in the last century, a few grey squirrels were released in southern Britain. They bred rapidly and spread.
Figure 2 shows the distribution of red squirrels and grey squirrels in Britain today.

Figure 2



There is no evidence that grey squirrels are aggressive towards red squirrels.

4 (a) (i) Suggest **one** way by which the spread of grey squirrels led to the distribution of red squirrels seen today.

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(2 marks)

4 (a) (ii) The area labelled **W** on **Figure 2** is the only place in southern Britain where red squirrels are still found.
Suggest why.

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(1 mark)

Question 4 continues on the next page

4 (b) Ecologists carried out a study in two similar forests, **P** and **Q**, in northern Britain.

- **P** had only red squirrels living there.
- **Q** had both red and grey squirrels living there.

The ecologists recorded the mean body mass of the female red squirrels in both areas. They also measured the female red squirrels' breeding success as the percentage giving birth in spring, in summer or both.

The results are shown in **Table 2**.

Table 2

Forest	Female red squirrels			
	Mean body mass / g	Breeding success / percentage giving birth		
		In spring	In summer	In both spring and summer
P (Red squirrels only)	317	56	50	26
Q (Red and grey squirrels)	291	56	33	0

Use the information in **Table 2** to explain the differences in breeding success between red squirrels in forests **P** and **Q**.

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(4 marks)

(Extra space) .....

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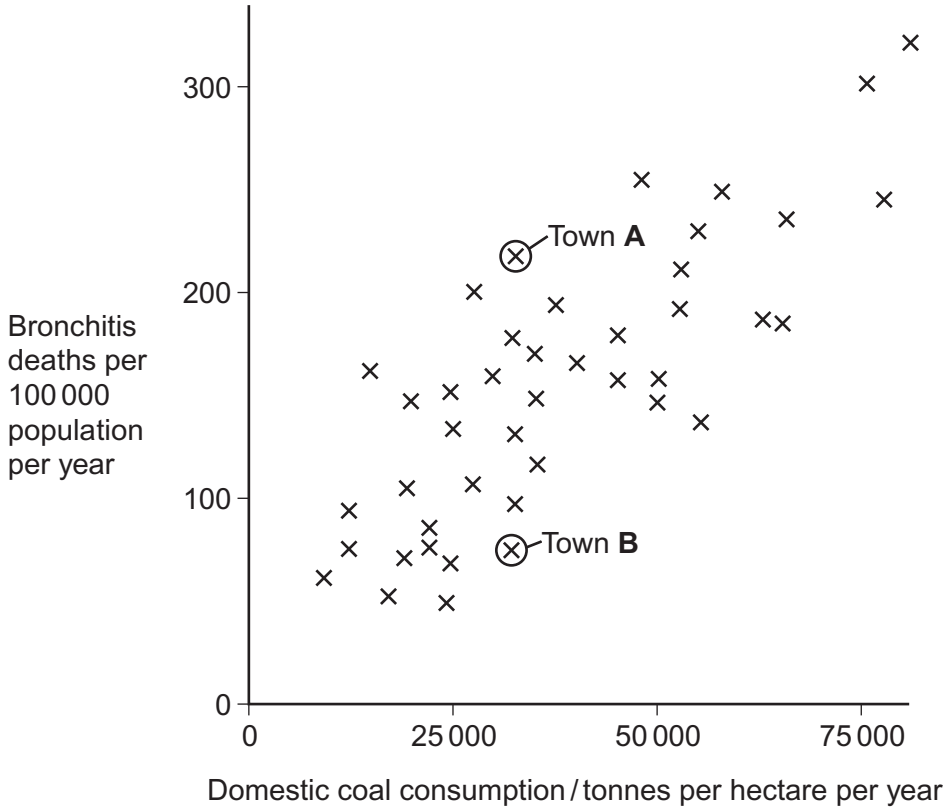
7

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

5 (a) Coal fires in houses used to be common in towns in England and Wales. They were banned because of the air pollution they caused. Air pollution may cause bronchitis. **Figure 3** shows the death rate from bronchitis in towns in England and Wales where different amounts of coal were burnt.

Figure 3



5 (a) (i) These data show a strong positive correlation with P<0.001.
Explain what is meant by this.

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(2 marks)

5 (a) (ii) Compare the data for town **A** with the data for town **B** shown in **Figure 3**.

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(1 mark)

5 (a) (iii) Suggest **one** reason for the difference in bronchitis deaths between town **A** and town **B**.

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(1 mark)

5 (b) Bronchitis involves swelling of the lining of the airways in the lungs and the production of thick mucus.
People with cardiovascular disease are more likely to die if they develop bronchitis than people without cardiovascular disease.
Suggest **one** reason why.

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(2 marks)

6

Turn over for the next question

6 (a) Succession takes place on a new brown-field site. This involves changes in the vegetation on the site.
Explain why these changes take place.

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(3 marks)

(Extra space) .....

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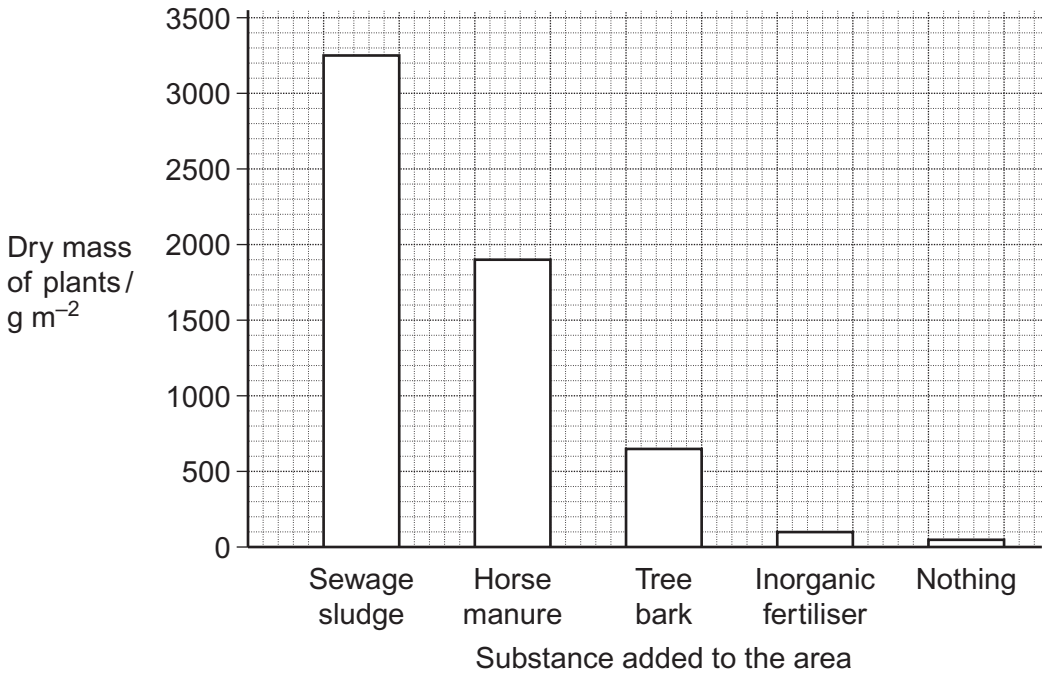
6 (b) Ecologists compared the effects of different treatments in encouraging growth of plants on a brown-field site. They selected five identical areas of the site and added a different substance to four of the areas. They added nothing to the fifth area. A year later they found the dry mass of the plants in each area.

The results are shown in **Figure 4**.

Figure 4



6 (b) (i) The ecologists chose dry mass instead of fresh mass to measure the growth of the plants. Explain why.

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(2 marks)

6 (b) (ii) Calculate the ratio between the dry mass of plants from the area where sewage sludge was added and the dry mass of plants from the area where tree bark was added.
Show your working.

Ratio = ... : 1

(2 marks)

6 (b) (iii) Horse manure contains a high proportion of undigested plant material and other organic waste from horses' guts.
Suggest **two** reasons for the difference between the result for the area where horse manure was added and the result for the area where inorganic fertiliser was added.

1 .....

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2 .....

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(2 marks)

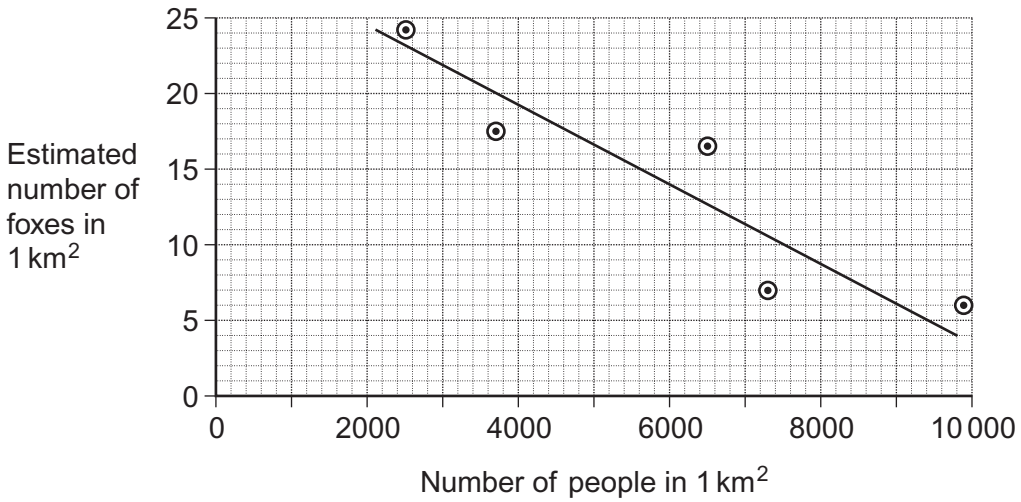
9

Turn over ▶

7 (a) Urban foxes live in many towns and cities in England. A zoologist carried out a survey on the number of urban foxes living in five different 1 km^2 areas of a city. Each area had a different number of people living in it.

The results are shown in **Figure 5**.

Figure 5



A student who saw these results concluded that more people living in an area was the cause of fewer urban foxes living in the same area.

Do these results support this conclusion? Give reasons for your answer.

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(4 marks)

(Extra space) .....

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7 (b) Sarcoptic mange is a disease of foxes. It can cause death rates of up to 97% in populations of urban foxes. Natural selection might result in a population of urban foxes which are all resistant to sarcoptic mange.
Explain how.

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(4 marks)

(Extra space) .....

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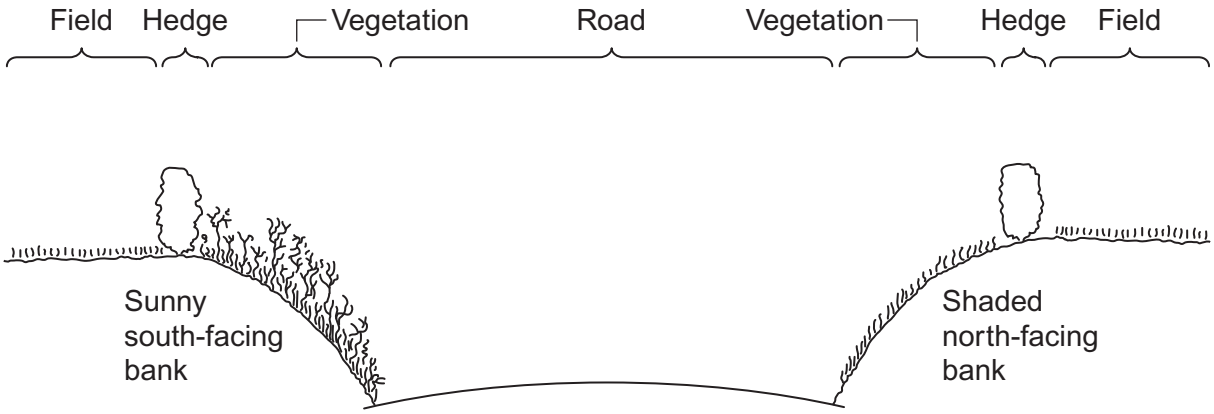
8

Turn over for the next question

8 **Figure 6** shows a section through a road and the land bordering it. On each side of the road there is a bank with a hedge on the top. The south-facing bank receives sunlight throughout most of the day. The north-facing bank is nearly always in shade. There is a field on the other side of each hedge.

Figure 6



8 (a) A biologist surveyed the plants and animals found along a 10-metre stretch of both the south-facing bank and the north-facing bank. He found that on the south-facing bank there were more species of animals than on the north-facing bank.
Explain why.

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(3 marks)

(Extra space) .....

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8 (b) (i) Some biologists believe that busy wide roads such as motorways might lead to allopatric speciation of small mammals such as field mice.
Explain how.

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(3 marks)

(Extra space) .....

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8 (b) (ii) Suggest how the biologists could determine whether field mice in fields on opposite sides of a motorway belonged to the same species.

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(3 marks)

(Extra space) .....

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9

9 (a) Pollen contains allergens which can cause hay fever in some people.
Explain how the breathing in of pollen leads to an allergic response.

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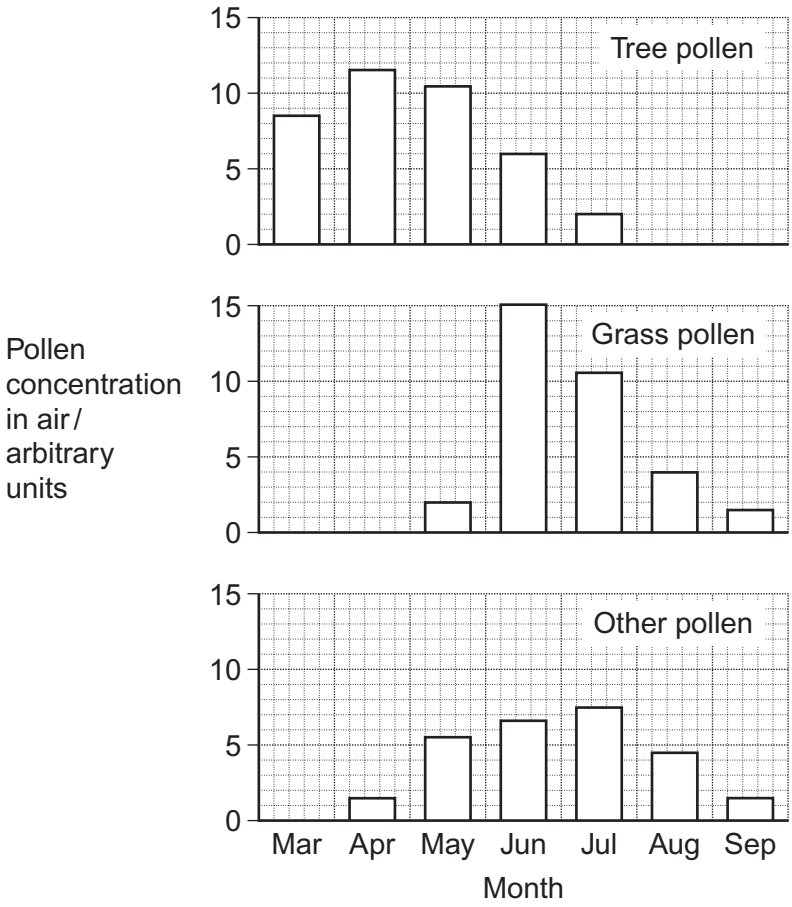
(3 marks)

9 (b) **Figure 7** shows the mean pollen concentration in the air produced by different types of plants over a 7-month period.

Figure 7



A doctor recorded the number of new cases of hay fever reported by her patients each month. Her data are shown in **Table 3**.

Table 3

Month	March	April	May	June	July	August	September
Number of new cases of hay fever	0	2	7	23	21	14	3

9 (b) (i) The doctor concluded that most of her hay fever patients were allergic to grass pollen. Use the data in **Figure 7** and **Table 3** to evaluate her conclusion.

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(3 marks)

(Extra space) .....

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9 (b) (ii) Describe how a scientist could test whether allergy to grass pollen is the most common cause of hay fever.

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(2 marks)

Question 9 continues on the next page

9 (c) Climate warming in the UK may change the occurrence of hay fever cases from that shown in **Table 3**.
Suggest and explain **two** ways in which it may change.

1 .....

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2 .....

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(2 marks)

10

ESSAY

You should write your essay in continuous prose.

Your essay will be marked for its scientific accuracy. It will also be marked for your selection of relevant material from different parts of the specification and for the quality of your written communication.

The maximum number of marks that can be awarded is:

Scientific content	16
Breadth of knowledge	3
Relevance	3
Quality of Written Communication	3

10 Write an essay on **one** of the topics below.

EITHER

10 (a) Production and effects of carbon dioxide in the body and in the environment. *(25 marks)*

OR

10 (b) There are many types of interactions and relationships between humans and other organisms. *(25 marks)*

END OF QUESTIONS

If you want to make a plan write it here.

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