

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education  
Advanced Level Examination  
June 2010

# Human Biology

## HBIO5

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

**Friday 25 June 2010 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.
- You may ask for extra paper. Extra paper must be secured to this booklet.
- 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 will be marked on your ability to:
  - use good English
  - organise information clearly
  - use scientific terminology accurately.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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6	
7	
8	
9	
10	
11	
TOTAL	



JUN10HBIO501

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

**1 (a)** Individuals in a population show phenotypic variation.

Give the **two** types of factor that cause this variation.

1 .....

2 ..... (2 marks)

**1 (b)** What is allopatric speciation?

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..... (2 marks)

4



**2 (a) (i)** Give **two** products of the light-dependent stage of photosynthesis.

1 .....

2 .....

(2 marks)

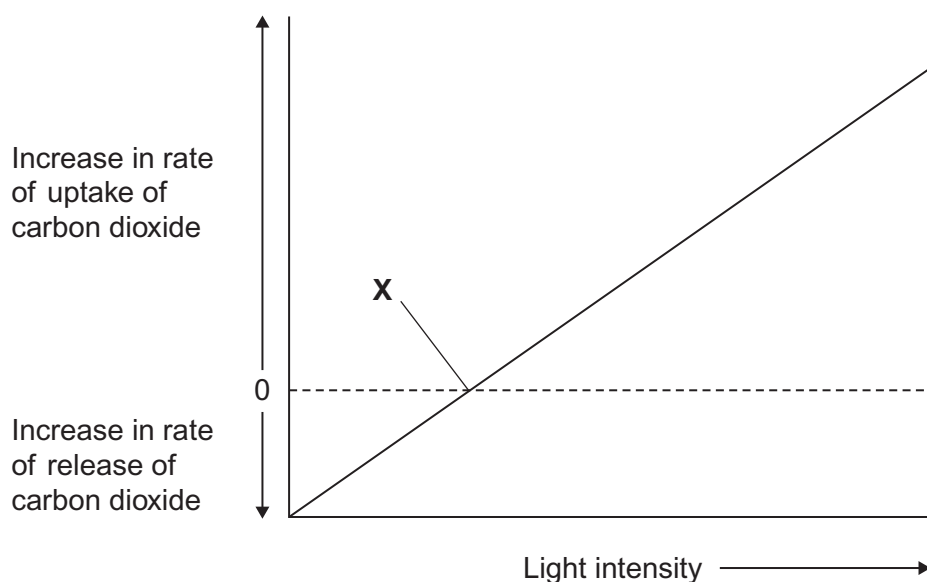
**2 (a) (ii)** The products of the light-dependent stage are used in the light-independent stage of photosynthesis. What are these products used for?

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(1 mark)

**2 (b)** The graph shows the rate of uptake or release of carbon dioxide by a plant at different light intensities.



Explain the rate of carbon dioxide exchange at point X.

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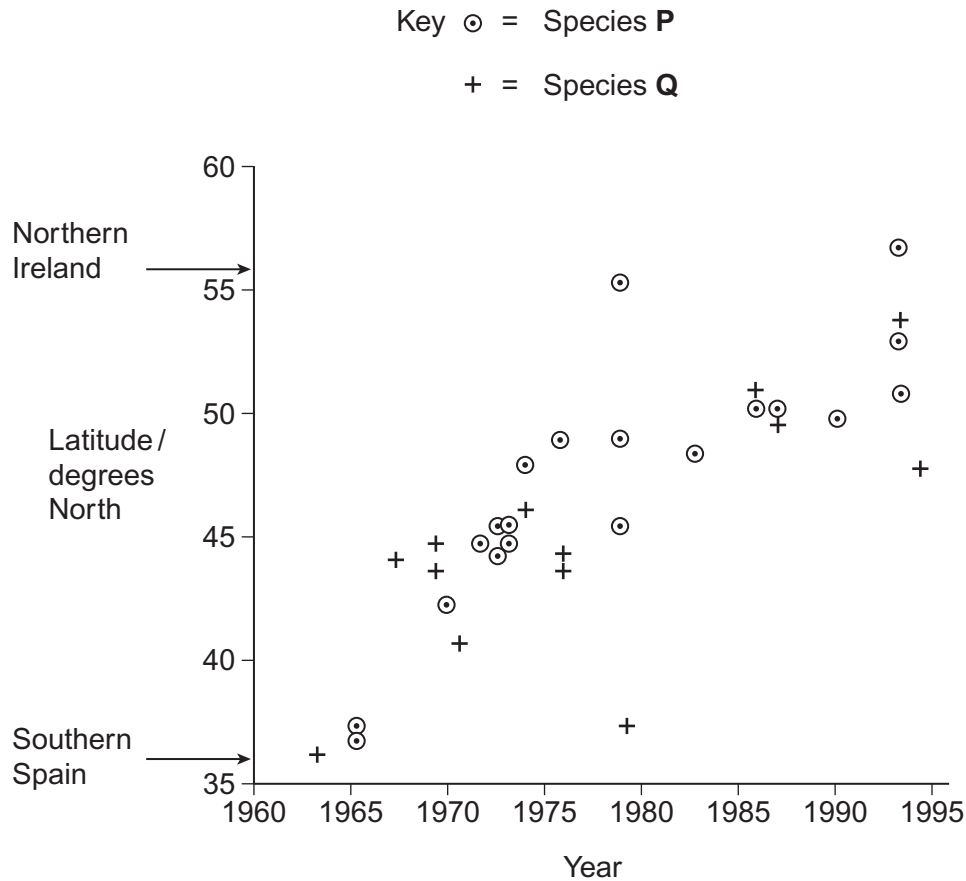
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(2 marks)



- 3** Ecologists discovered that two species of fish, **P** and **Q**, were being caught near the coast of Ireland for the first time. They obtained records of where and when these species had been caught in the past. The sites ranged from southern Spain, at a latitude of about 36°North, to the north of Northern Ireland, at a latitude of about 56°North.

The graph shows where and when the species were caught.



- 3 (a)** Describe the results.

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(2 marks)



- 3 (b)** The ecologists concluded that these results were related to climate change. Suggest how climate change could have produced these results.

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(3 marks)

(Extra space) .....

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**Turn over for the next question**

**Turn over ►**



**4** Over 50% of household waste is biodegradable. This type of waste consists of garden waste, food waste, paper and cardboard.

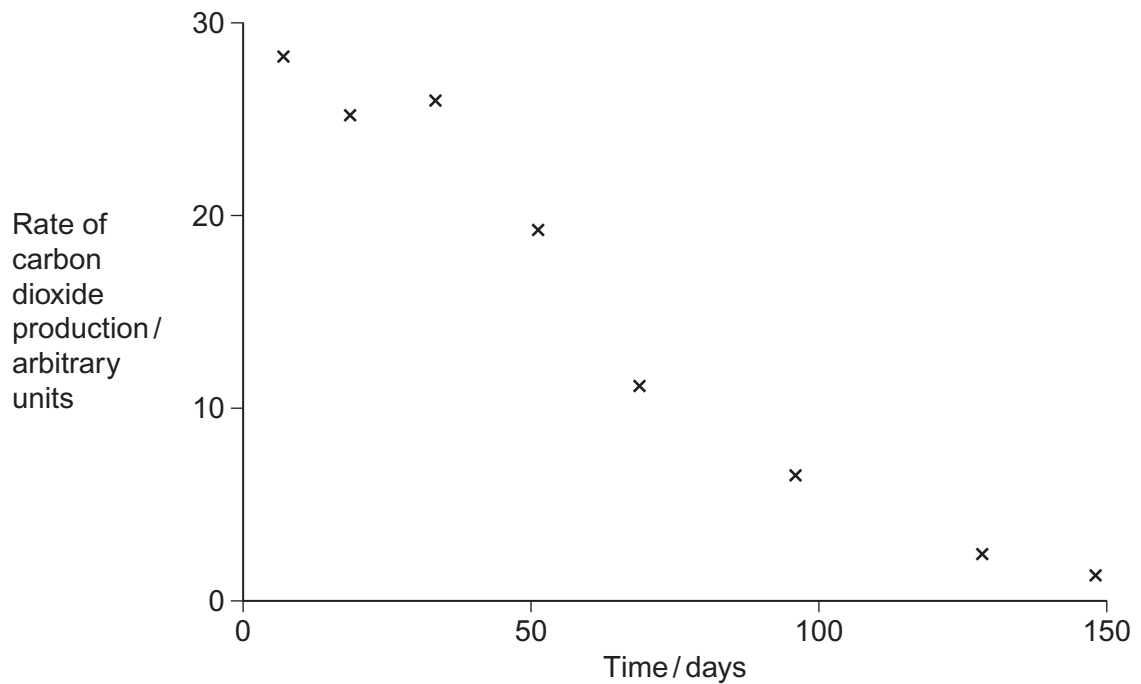
**4 (a)** Biodegradable waste is often put into landfill, where it is decomposed by anaerobic bacteria. These bacteria produce a gas which can be burned as a fuel. Name this gas.

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(1 mark)

Scientists investigated the use of a composter to break down biodegradable waste using microorganisms. The composter is a very large metal container.

Biodegradable waste was put into the composter. The scientists measured the rate of carbon dioxide production in the composter at intervals over a period of 150 days. Air was blown into the composter all the time and the temperature inside was maintained at about 40°C.

The graph shows their results.



- 4 (b)** Name the process that produced the carbon dioxide.

Process.....  
(1 mark)

- 4 (c)** Suggest an explanation for the results.

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(3 marks)

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**Turn over for the next question**

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**5 (a)** In respiration in cells,

**5 (a) (i)** where does glycolysis take place

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(1 mark)

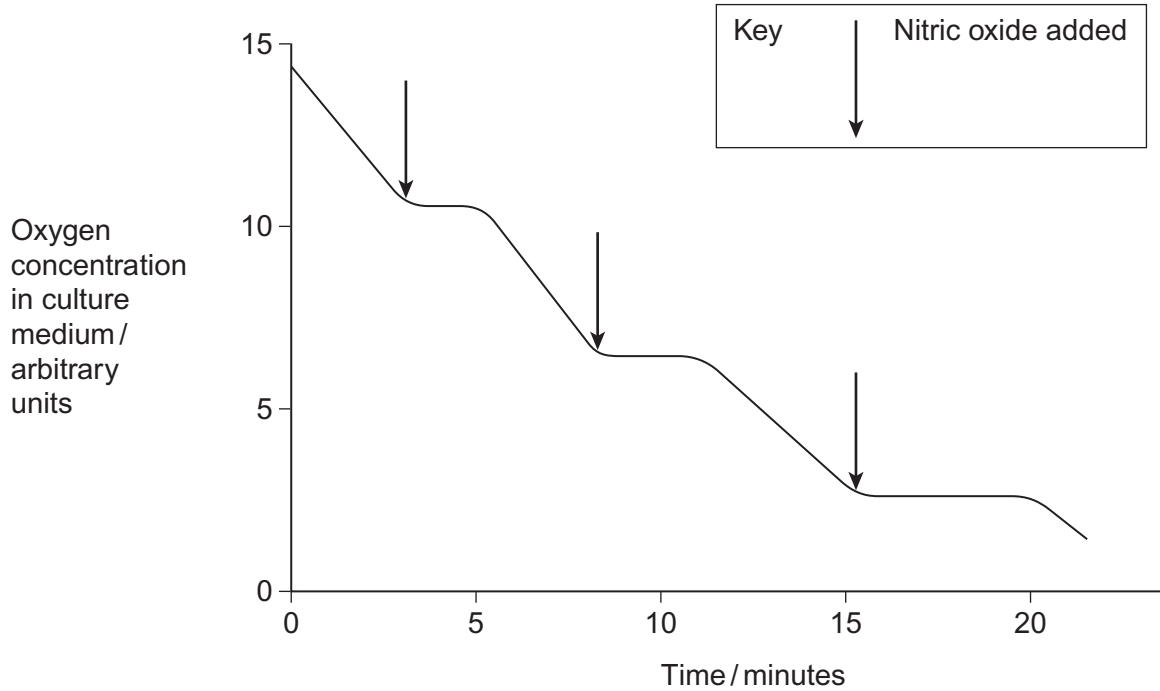
**5 (a) (ii)** where, exactly, is the electron transfer chain found?

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(1 mark)



- 5 (b)** Scientists kept kidney cells in a liquid culture. They investigated the effect of the gas nitric oxide on oxygen consumption by these cells. They recorded the oxygen concentration in the culture medium over a period of time. At intervals they added a small volume of nitric oxide to the culture medium. Nitric oxide affects the functioning of a protein in the electron transport chain.

The graph shows their results.



Explain the effect of nitric oxide.

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(3 marks)

(Extra space) .....

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6 (a) What is meant by a

6 (a) (i) population

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(1 mark)

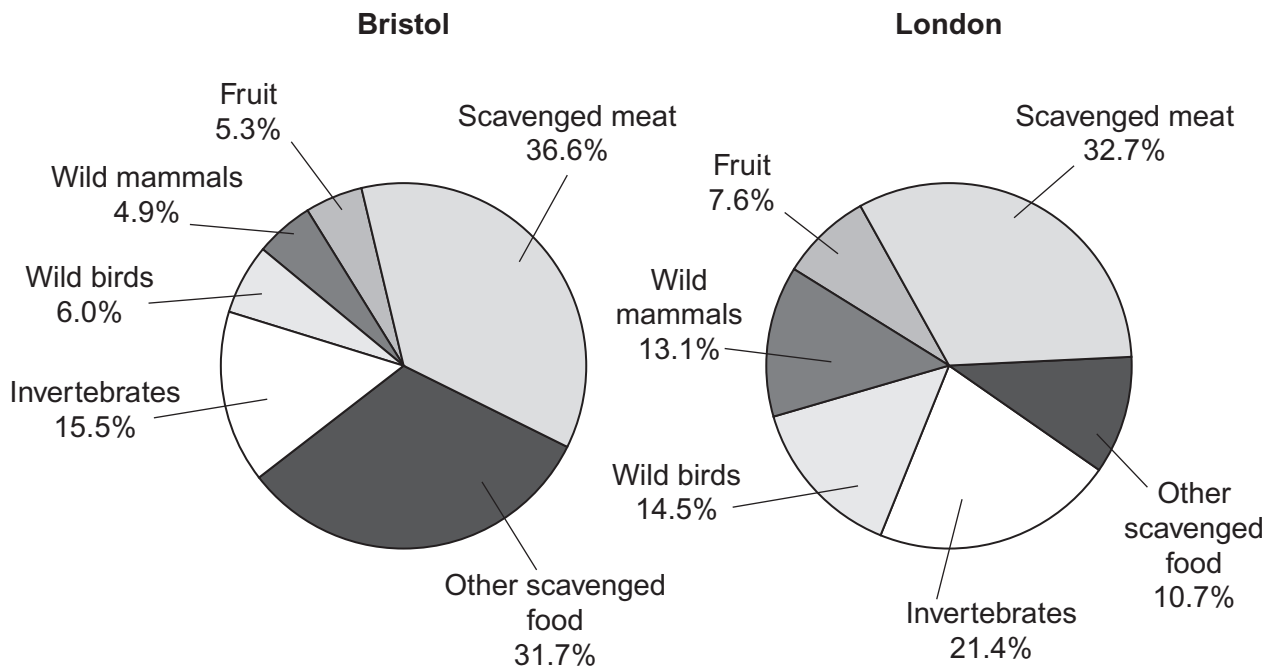
6 (a) (ii) community?

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(1 mark)

Ecologists investigated the diets of populations of urban foxes in Bristol and London. The pie charts show their results.



Scavenged meat and other scavenged food is human food to which foxes can get access. The wild mammals are mainly rats and mice. The wild birds are mainly pigeons. The invertebrates include earthworms and insects.



- 6 (b)** Describe the major differences between the diets of foxes in Bristol and London.

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(3 marks)

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- 6 (c)** Other than the availability of scavenged food, suggest **one** way that human activity has increased the food available to foxes.

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(2 marks)

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Turn over for the next question

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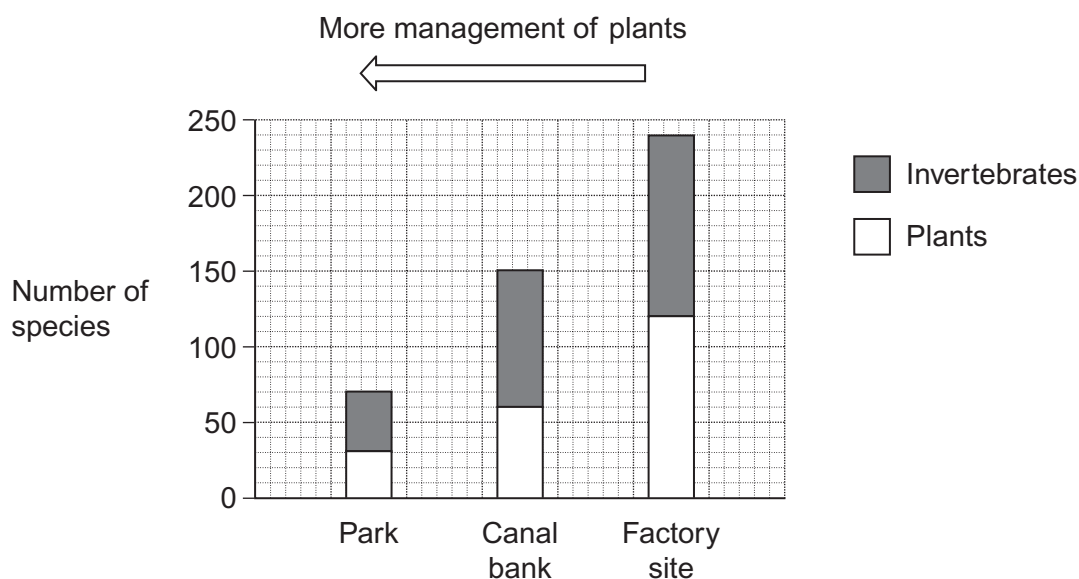
7 (a) What is a brownfield site?

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(1 mark)

An ecologist investigated three large sites in a city. The sites were a park, a canal bank and a site where a factory had been demolished. At each site, the ecologist recorded the number of species of plants and invertebrate animals. He also determined the biodiversity at each site and how much the plants at each site were managed by people. The graph shows his results.



7 (b) Biodiversity is measured using data on the number of species present at a site and the number of individuals of each species present. Describe how you could estimate the number of individuals of a particular plant species present at each site.

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(3 marks)

(Extra space) .....

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**7 (c)** What is the ratio of invertebrate to plant species in the park?

Show your working

Ratio..... (2 marks)

**7 (d)** The ecologist concluded that management affects biodiversity.

Evaluate this conclusion.

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(Extra space) ..... (3 marks)

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Turn over ►



**8 (a)** What causes acne?

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(2 marks)

Doctors investigated the effectiveness of two creams used to treat acne. Both creams contain an antibacterial agent called benzoyl peroxide. One cream also contains hydrocortisone, a substance that reduces inflammation.

100 volunteers with acne were divided at random into three groups. Each group was given a different cream, **A**, **B** or **C**, to use on their acne over a twelve-week period.

- Cream **A**, skin cream containing benzoyl peroxide
- Cream **B**, skin cream containing benzoyl peroxide and hydrocortisone
- Cream **C**, skin cream only

The doctors used a facial score to measure how severe each volunteer's acne was before and after using a cream. The larger the facial score, the worse the acne. The table shows their results.

Cream used	Mean facial score / arbitrary units		
	Before using cream	After using cream	Percentage reduction in facial score
<b>A</b>	8.4	3.3	60.7
<b>B</b>	7.3		43.8
<b>C</b>	7.2	4.6	36.1

**8 (b)** Complete the table by calculating the mean facial score after using cream **B**.

Show your working.

(2 marks)



**8 (c)** Why were some volunteers given cream **C** to use?

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(1 mark)

**8 (d)** One magazine writer who read the report of this investigation concluded that cream **A** was the best to use if you had acne.

Evaluate this conclusion.

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(4 marks)

(Extra space) .....

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9 (a) What is an allergen?

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(1 mark)

9 (b) During an allergic response, histamine is produced in response to an allergen. Describe how.

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(3 marks)

(Extra space) .....

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There are three tests that can be used to determine if someone is allergic to peanuts.

1. The skin prick test involves scratching the skin with a needle covered with peanut extract.
2. The immunoassay test uses antibody to test a blood sample.
3. The food challenge test involves feeding a patient food containing peanuts. This test is carried out in hospital, under the direct supervision of a doctor.

The table gives more features of each test.

Test	Percentage of tests that work with a low concentration of peanut allergen	Percentage of results that are specific for peanut allergy	Percentage of positive results for peanut allergy that are false	Relative cost of each test	Relative risk of adverse reaction from the test
Skin prick	≥ 95	30 to 60	≥ 50	Very cheap	Small
Immuno-assay	57	100	0	Expensive	None
Food challenge	100	100	0	Very expensive	Very high



- 9 (c)** Doctors usually carry out the skin prick test first on someone to find out whether he or she has an allergy to peanuts.

Give **one** reason why this test is usually used first, rather than the immunoassay or food challenge tests.

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 (1 mark)

- 9 (d)** A person suffered anaphylaxis after eating a meal. Doctors thought that this was caused by an allergy to peanuts and they carried out a food challenge test.

Suggest why, in this case, the doctors used this test, rather than the skin prick or immunoassay tests.

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- 10** High density lipoproteins (HDLs) are found in blood plasma. Higher concentrations of HDL in blood correlate with a lower risk of atheroma formation in arteries.

Scientists investigated the effects of different diets on HDL concentrations in the blood of rabbits. The scientists used four groups of rabbits, **W**, **X**, **Y** and **Z** and fed them on the following diets.

- Group **W**, diet with no cholesterol
- Group **X**, diet containing 1% cholesterol
- Group **Y**, diet containing 1% cholesterol and *Enterococcus faecium*
- Group **Z**, diet containing 1% cholesterol and a statin

*Enterococcus faecium* (*E. faecium*) is a bacterium used in some pro-biotic foods. Statins are drugs that some people take to lower the concentration of cholesterol in their blood. High cholesterol concentrations in blood can increase the risk of atheroma formation.

The scientists measured the concentration of HDL in the blood of the rabbits at the start of the investigation and after 60 days on the diet.

The table shows their results.

Diet	Mean HDL concentration in blood/ mg per 100 cm <sup>3</sup> (± standard error)	
	Start of investigation	After 60 days
<b>W</b> – no cholesterol	31.5 (± 2.3)	28.8 (± 2.8)
<b>X</b> – 1% cholesterol	28.5 (± 2.5)	16.8 (± 2.8)
<b>Y</b> – 1% cholesterol and <i>E. faecium</i>	30.3 (± 1.5)	24.0 (± 1.9)
<b>Z</b> – 1% cholesterol and statin	32.5 (± 4.8)	33.3 (± 3.3)



**10 (a)** Describe the results.

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(3 marks)

(Extra space) .....

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**10 (b)** Do these data support the conclusion that there is an advantage to people of eating foods containing *E. faecium*? Give reasons for your answer.

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(4 marks)

(Extra space) .....

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**ESSAY**

You should write your essay in continuous prose.

Your essay will be marked not only 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

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

**EITHER**

**11 (a)** The functions of proteins are linked to their shape. (25 marks)

**OR**

**11 (b)** What causes humans to become ill. (25 marks)

**END OF QUESTIONS**

If you want to make a plan write it here.

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