Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
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7	
8	
9	
TOTAL	

General Certificate of Secondary Education
Higher Tier
November 2012

Science B

SCB1HP

Unit 1 My World

H

Written Paper

Monday 5 November 2012 9.00 am to 10.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 1 hour

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 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 2(c) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

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

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

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

1 (a) The structure of the Earth has three parts. The outer part is the crust.

Name the other **two** parts of the Earth.

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(1 mark)

1 (b) (i) The Earth's crust is broken into pieces.

Give the name of the pieces of the Earth's crust.

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(1 mark)

1 (b) (ii) The pieces of the Earth's crust move.

The theory that describes the movement of the pieces of the Earth's crust is called continental drift.

Explain how continental drift happens.

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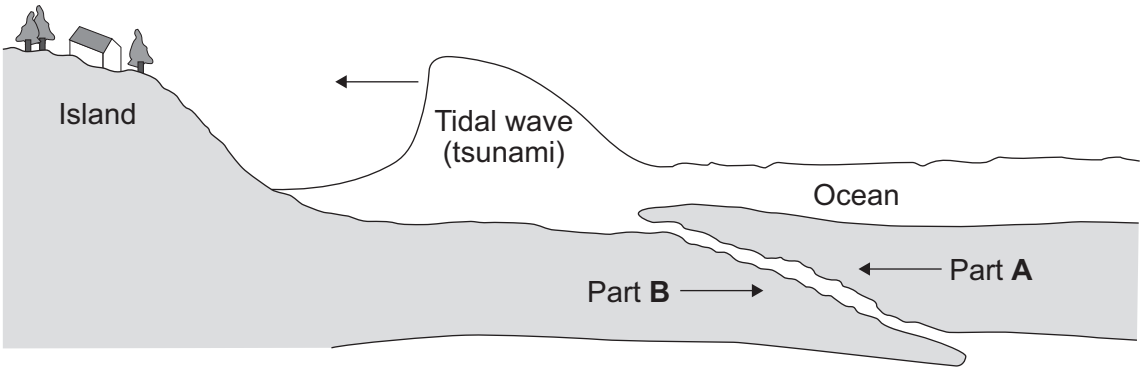
(3 marks)

Question 1 continues on the next page

1 (b) (iii) The diagram shows two parts of the Earth's crust moving together.



The table shows information about how far the part of the crust labelled **A** moved in relation to the part of the crust labelled **B** on each date.

Date	**Jan 1st**	**Feb 1st**	**Mar 1st**	**Apr 1st**	**May 1st**	**Jun 1st**	**July 1st**	**July 8th**	**Aug 1st**	**Sep 1st**	**Oct 1st**	**Nov 1st**
Movement of **A** over **B** in metres	0.05	0.05	0.05	0.05	0.05	0.05	0.05	7.0	0.05	0.05	0.05	0.05
Upward movement in metres	0.01	0.02	0.01	0.01	0.03	0.02	0.03	21.0	0.06	0.05	0.04	0.02

Use information from the diagram and the table to give the date of the tidal wave (tsunami), and to explain how the tidal wave (tsunami) shown in the diagram was caused.

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(4 marks)

9

Turn over for the next question

2 Plants produce hormones.

2 (a) One hormone controls plant growth.

Give the name of the hormone that controls plant growth.

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(1 mark)

2 (b) Plant shoots grow towards the light. Name this growth response.

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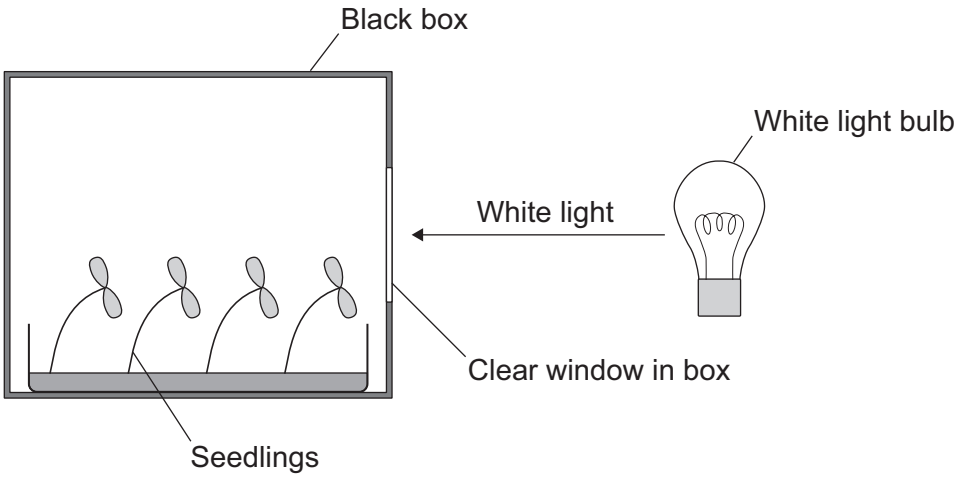
(1 mark)

2 (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

A student grew some plants in white light and noted how they responded.



Suggest how you could do an experiment to find out if the plants have the same response to different colours of light.

You should include:

- the apparatus you would use
- the variables you would control
- what observations you would make.

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(6 marks)

8

Turn over for the next question

3 Pond weed produces bubbles that contain a mixture of gases.

A student kept some pond weed in a closed tank of water.

The student kept the tank next to a window for two days.

The pond weed produced a large bubble of gas. The student collected the gas in a tube.

Figure 1 shows the gas bubble in the tube.

The student added a chemical to absorb any carbon dioxide in the gas.

Figure 2 shows the gas bubble after the carbon dioxide had been absorbed.

The student added a different chemical to absorb any oxygen in the gas.

Figure 3 shows the gas bubble after the carbon dioxide and oxygen had been absorbed.

Figure 1

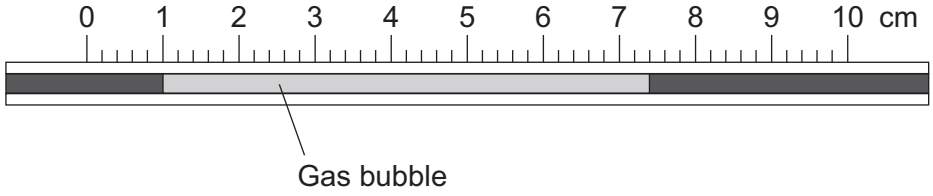


Figure 2

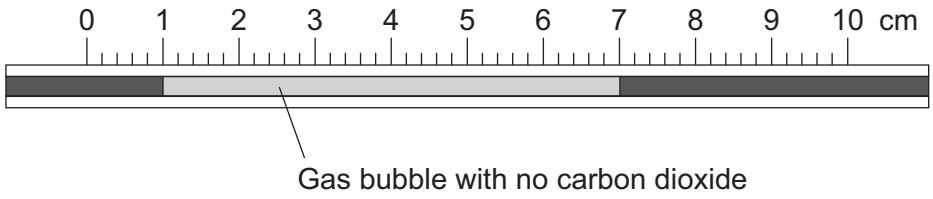
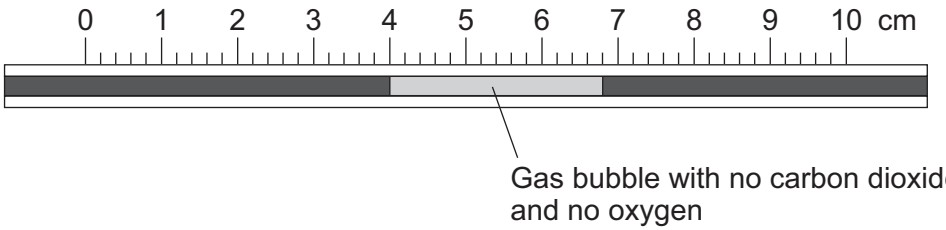


Figure 3



3 (a) Read the length of gas bubble in each diagram. Write your answers in the table.

Length of gas bubble in **Figure 1** in cm	…….....
Length of gas bubble in **Figure 2** in cm	……
Length of gas bubble in **Figure 3** in cm	……..

(2 marks)

3 (b) Use the information in the diagrams to calculate the percentage of oxygen in the gas bubble.

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Answer ..... %

(3 marks)

3 (c) The gas collected from the pond weed contained more oxygen than pond water. Why?

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(1 mark)

6

Turn over for the next question

4 Some plants can absorb nickel ions from mining waste.

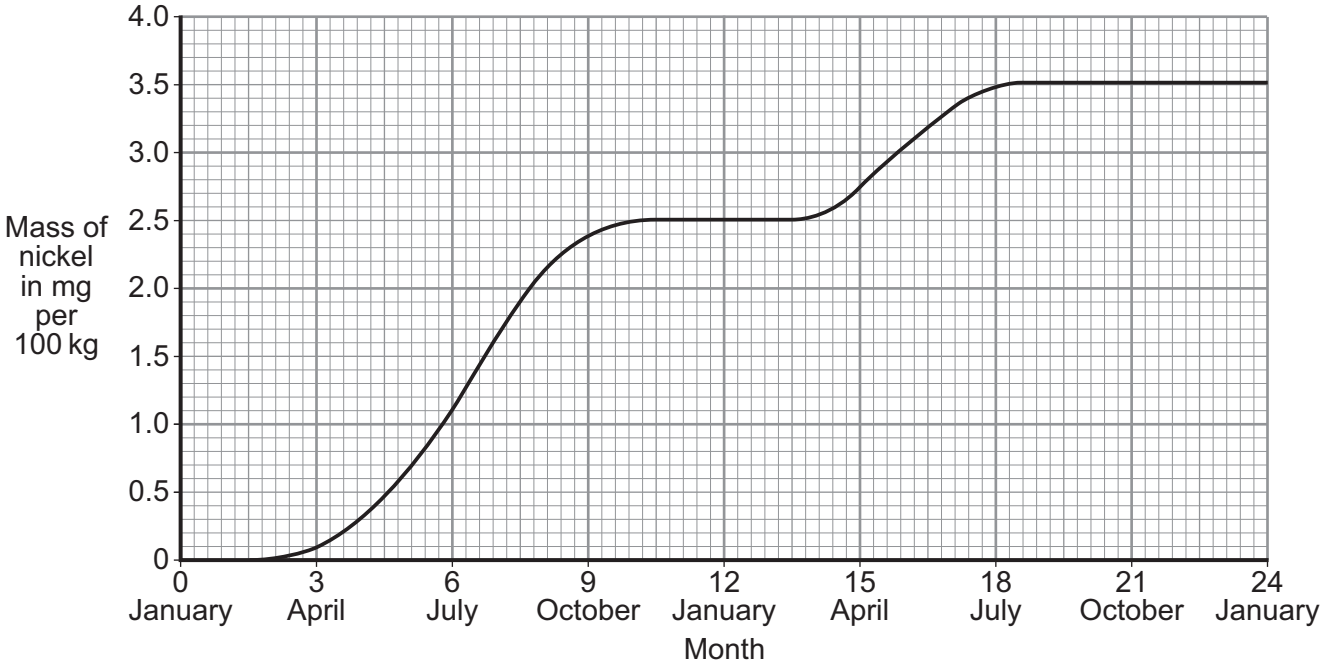
The plants can concentrate the nickel ions from the waste in their tissues.

The plants are burned and the nickel can then be recovered from the ashes.

This method of using plants to extract metals from soil is called phytomining.

A group of scientists investigated how well a plant absorbed nickel from soil. The plant seeds germinate in February and the plants live for 2 years.

The scientists took a 1 kg sample of the plants at regular intervals and measured the mass of nickel in the plants. The graph shows the scientists' results.



4 (a) The scientists wanted to extract the maximum amount of nickel over 20 years.

Suggest how long each crop of plants should be left to grow before harvesting.

Use the trend shown in the graph to explain your answer.

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(4 marks)

4 (b) Suggest **two** advantages of using plants to extract metals from the ground compared with traditional mining methods.

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(2 marks)

4 (c) If the plants were not harvested but were left in the ground when they died, the nickel would be returned to the soil.

Describe what happens to the plants to allow the nickel to be returned to the soil.

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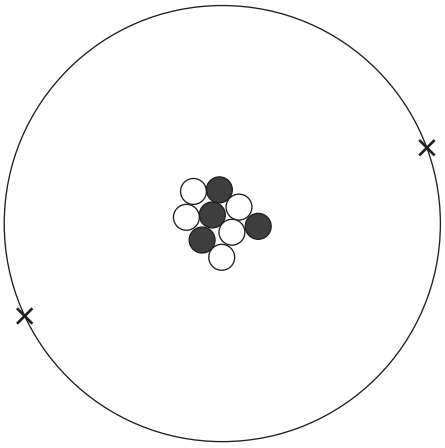
(2 marks)

8

5 Some information about beryllium (Be) and helium (He) is given.

Mass number	9	4
	Be	He
Atomic number	4	2

The diagram shows the structure of a beryllium ion.



5 (a) The diagram shows a beryllium ion, **not** a beryllium atom.

Explain why.

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(2 marks)

5 (b) The diagram does **not** show the structure of a helium atom.

Explain why.

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(1 mark)

5 (c) What charge does the ion have?

Explain your answer.

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(2 marks)

5

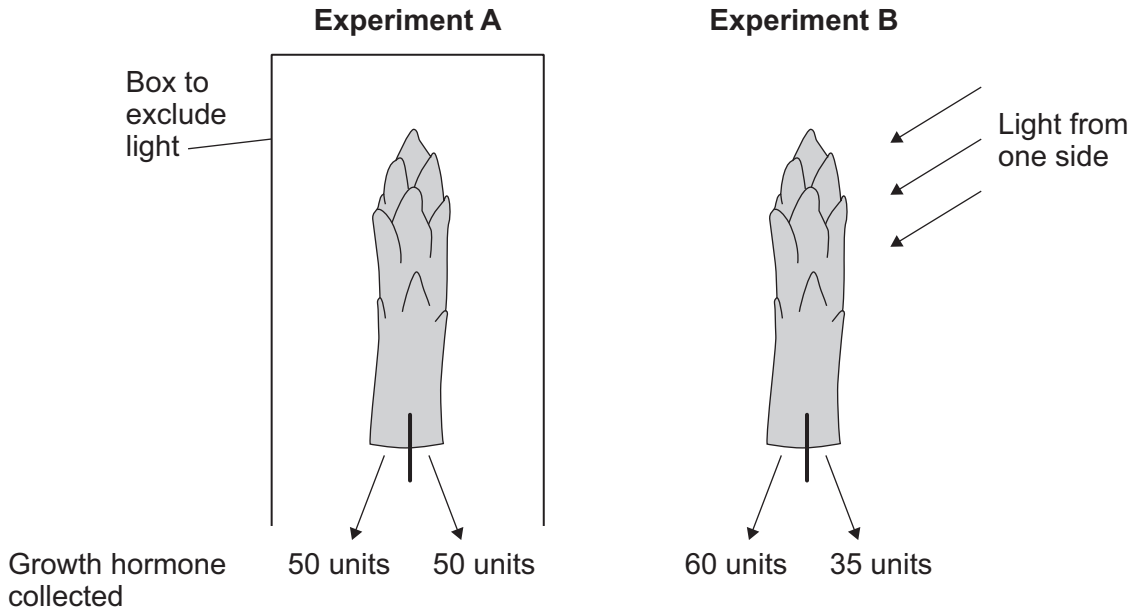
Turn over for the next question

6 The growth of asparagus shoots is controlled by a plant hormone.

Scientists set up two experiments using asparagus shoots.

- in Experiment **A**, the asparagus shoot was kept in the dark.
- in Experiment **B**, the asparagus shoot had light from one side.

The scientists collected growth hormone from the sides of each shoot.



6 (a) Suggest **three** ways that the distribution of growth hormone in Experiment **B** could be produced.

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(3 marks)

6 (b) Use evidence from Experiment **A** and Experiment **B** to explain the phototropic effect.

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(3 marks)

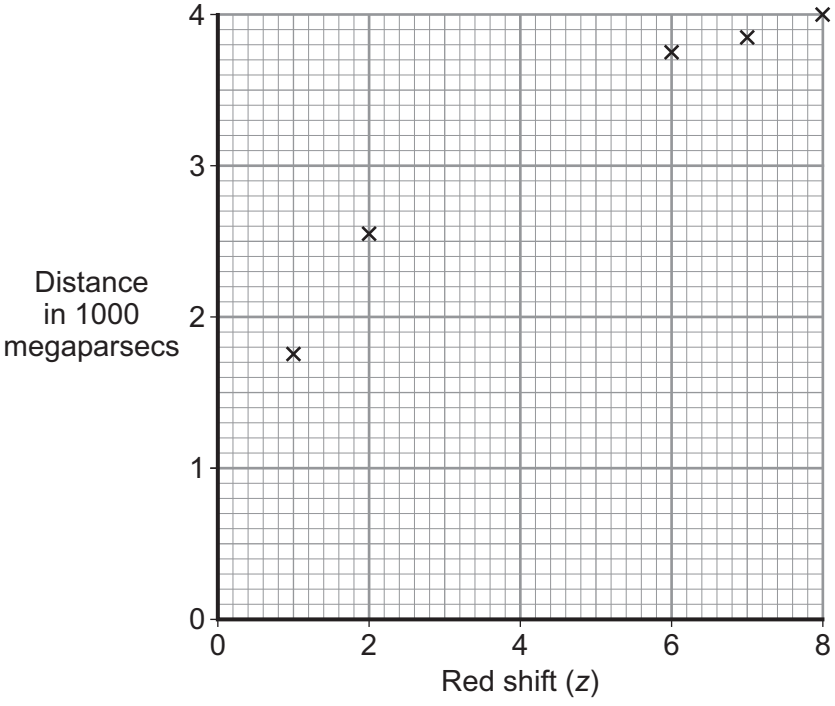
6

Turn over for the next question

7 The table gives some information about the relationship between the red shift of stars and the distance of the stars from Earth (1 megaparsec = 3.26 million light years).

Red shift (z)	Distance away from Earth in megaparsecs
1	1757
2	2535
3	3000
4	3300
5	3550
6	3732
7	3878
8	4000

7 (a) Plot the values for z = 3, 4 and 5 on the graph. Draw a line of best fit.



(2 marks)

7 (b) The starlight arriving on Earth is split into a spectrum. The spectrum always has black lines.

Red shift (z) can be calculated using the equation shown in the box.

$$1 + z = \frac{\text{wavelength of black line observed on Earth}}{\text{wavelength of black line produced by a star}}$$

The wavelength of a black line produced by a star is 400 nm.

The black line in the spectrum seen on Earth has a wavelength of 1440 nm.

7 (b) (i) Calculate the value for the red shift for this star.

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Answer .....
(2 marks)

7 (b) (ii) How far from the Earth is this star?

Use information from the graph to answer the question.

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Answer ..... megaparsecs
(1 mark)

5

Turn over for the next question

8 A scientist grew some plants in a closed greenhouse. The air in the greenhouse contained carbon dioxide made using radioactive carbon. When the scientist tested some of the plants after 3 days she found the organic molecules in the plants were radioactive.

8 (a) Name **one** organic molecule in the plant (not carbon dioxide) that would be radioactive.

Explain why the molecule would be radioactive.

Molecule .....

Explanation .....

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(3 marks)

8 (b) The scientist changed the air in the greenhouse. She made sure there was no radioactive carbon dioxide. Then she closed the greenhouse. The next day she bubbled some of the air through limewater. The limewater went cloudy.

8 (b) (i) Limewater contains calcium hydroxide ($Ca(OH)_2$). Calcium hydroxide reacts with carbon dioxide to produce insoluble calcium carbonate.

Write a symbol equation for the reaction between limewater and carbon dioxide.

..... + ... ⟶ ..... + ...

(3 marks)

8 (b) (ii) Some of the carbon dioxide in the air was radioactive. Explain why.

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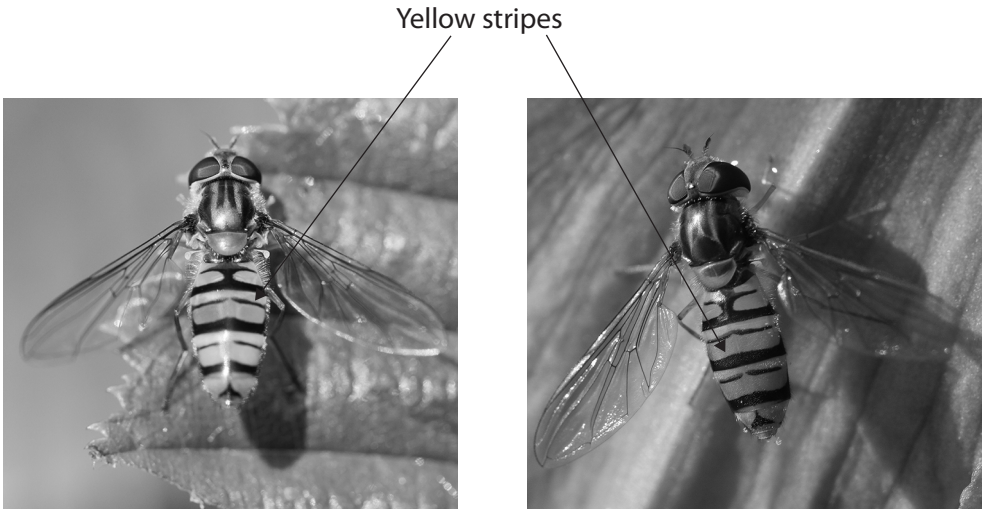
(2 marks)

8

9 Hoverflies and wasps have similar patterns of stripes. Wasps sting and have an unpleasant taste but hoverflies do not have an unpleasant taste. Some insects look like hoverflies but have no stripes. Birds eat these insects.



Hoverfly **Wasp**

Striped hoverflies have developed from ancestors that were **not** striped. Explain how.

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(5 marks)

5

END OF QUESTIONS

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