

Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier

Additional Science
Unit Biology B2

Biology 2H

Biology
Unit Biology B2

H

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

For this paper you must have:

- a ruler.

You may use a calculator.

Time allowed

- 60 minutes

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 space 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 6(b) 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.

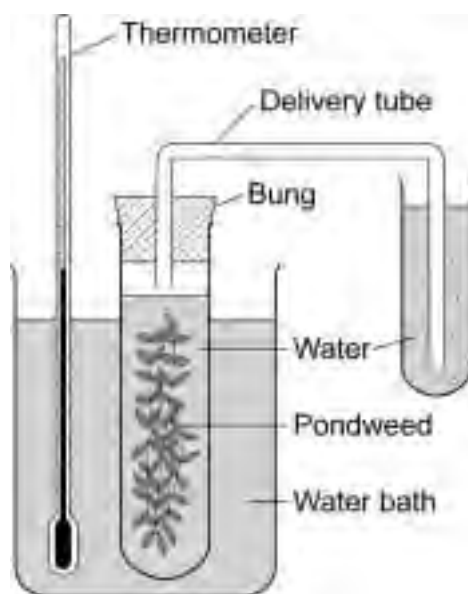
Answer **all** questions in the spaces provided.

1 Plants produce food by photosynthesis.

1 (a) Complete the equation for photosynthesis.

carbon dioxide + (+ light energy) → glucose +
(2 marks)

Some students investigated the effect of temperature on the rate of photosynthesis in pond weed. They set up the apparatus and altered the temperature using ice and hot water. They counted the number of bubbles given off in a minute at different temperatures.

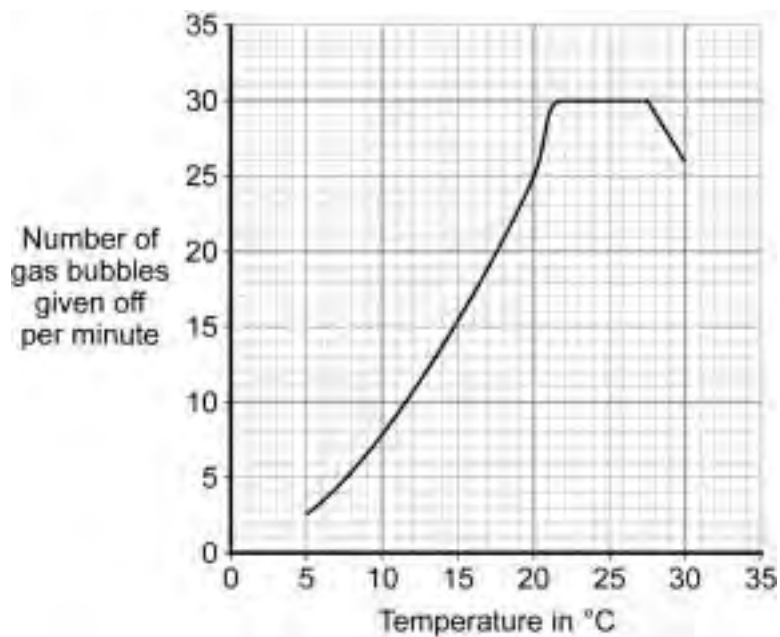


1 (b) Why did the students use a water bath?

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(1 mark)

The graph shows the students' results.



- 1 (c) Explain the shape of the graph between 22 °C and 27 °C.

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(2 marks)

Question 1 continues on the next page

Turn over ►

1 (d) A farmer wants to grow lettuces as quickly and cheaply as possible in winter.

1 (d) (i) At what temperature should he keep his greenhouse to grow the lettuces as quickly and cheaply as possible?

.....°C
(1 mark)

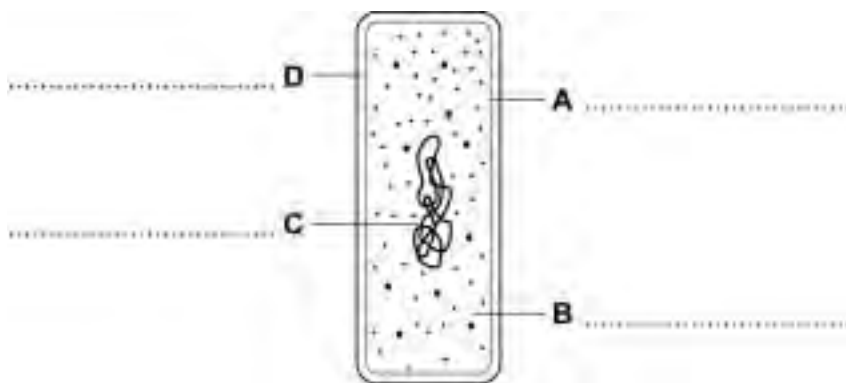
1 (d) (ii) Explain the reason for your answer.

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(2 marks)

8

2 The diagram shows a bacterium.



On the drawing, name the structures labelled A, B, C and D.

(4 marks)

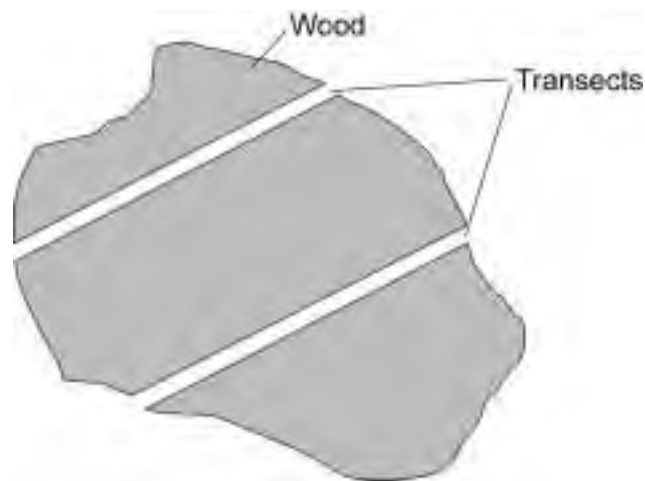
4

- 3** Red squirrels live in trees. They eat seeds from the cones of conifer trees. Squirrels store cones in 'larders' on the ground. These larders provide food through the winter. Each red squirrel makes and defends one larder.

Scientists monitor squirrel numbers to find the best habitats for the squirrel's survival. In one investigation, scientists estimated the numbers of squirrels in different types of woodland. Each woodland contains a different species of conifer tree.

Here is their method.

- Ten woods of each type of woodland were surveyed.
- In each wood scientists measured out two transects (strips), each 600 m long and 10 m wide.
- A scientist walked slowly down the centre of each transect, recording the number of squirrel larders he could see.



- 3 (a)** Name **one** variable that was controlled in this investigation.

.....
(1 mark)

- 3 (b) (i)** The scientists recorded the number of larders instead of the number of squirrels they saw.

How could this have increased the accuracy of the investigation?

.....
.....
(1 mark)

Question 3 continues on the next page

Turn over ►

- 3 (b) (ii)** This method of counting the number of ladders could have led to an inaccurate estimate of the number of squirrels.

Explain how.

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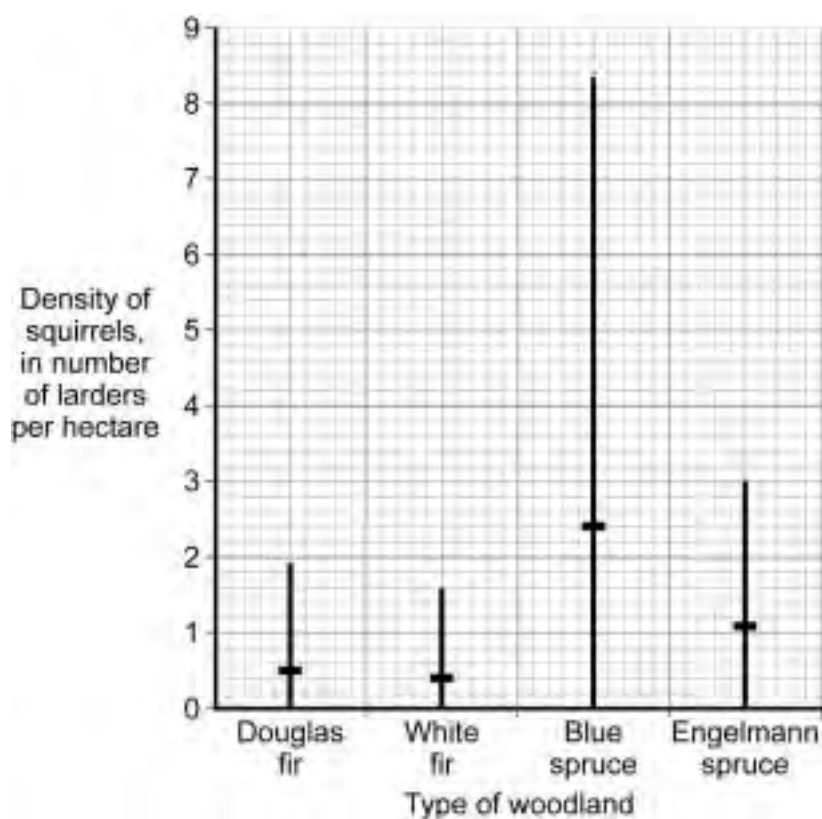
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(2 marks)

- 3 (c)** The results of the investigation are shown on the graph.



Each bar represents the range of the number of ladders in each type of woodland.

The horizontal mark on each bar represents the mean number of ladders per hectare of woodland.

3 (c) A student concluded '*You will always find more squirrels in spruce woodland than in fir woodland.*'

Is the student's conclusion justified by the data in the graph?

Explain the reasons for your answer.

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(2 marks)

6

4 Energy is obtained from both aerobic and anaerobic respiration during exercise.

4 (a) Give **three** differences between aerobic and anaerobic respiration.

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(3 marks)

Question 4 continues on the next page

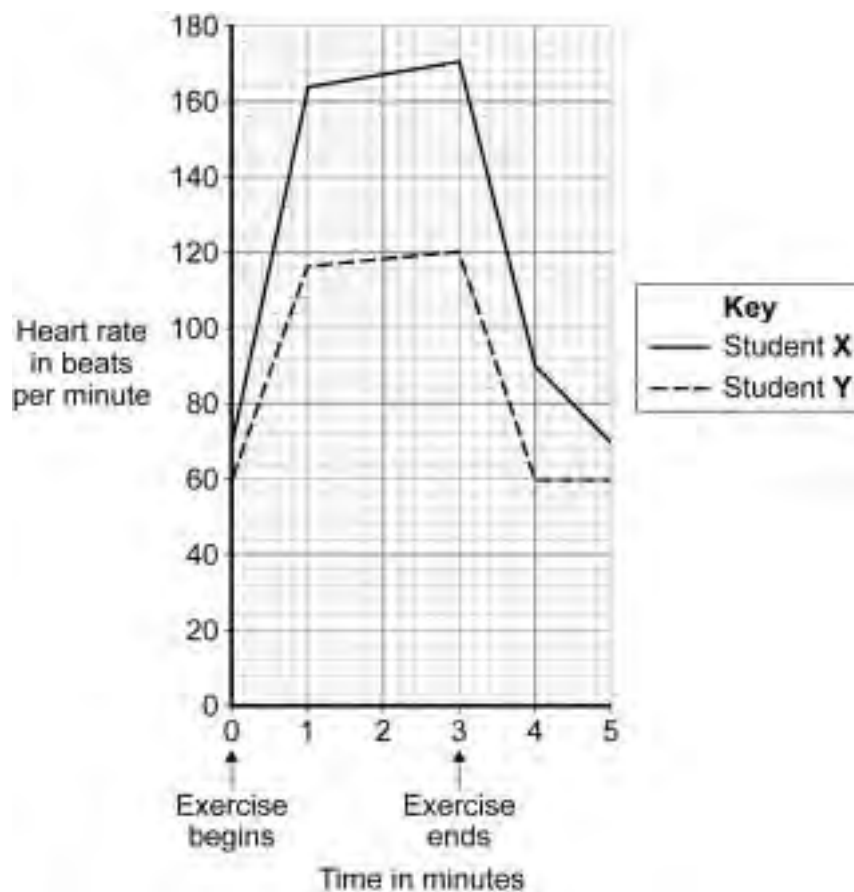
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4 (b) Two students did the same step-up exercise for 3 minutes.



One of the students was fit. The other student was unfit.

The graph shows how the students' heart rate changed during the exercise and after the exercise.



4 (b) Suggest which student was the fitter.

Draw a ring around your answer. **Student X / Student Y**

Give **three** reasons for your answer.

1

2

3

(3 marks)

4 (c) Explain the advantage to the students of the change in heart rate during exercise.

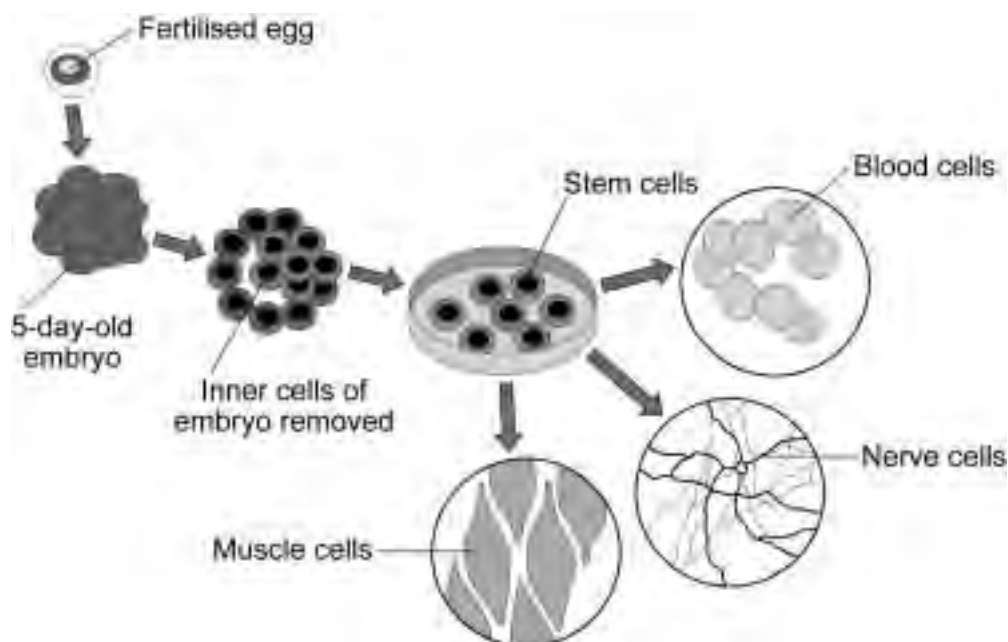
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(4 marks)

— 10

Turn over ►

5 The diagram shows one way that stem cells can be produced from human embryos.



5 (a) Stem cells can be used to treat a condition such as paralysis.

Explain why.

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(2 marks)

5 (b) During pregnancy, an umbilical cord and a placenta join the embryo to the mother. At birth the umbilical cord is cut.

Stem cells can be obtained from the umbilical cord.

Many people think that the stem cells for treating human conditions should be obtained from umbilical cords rather than human embryos.

Suggest **one** reason why.

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(1 mark)

5 (c) Stem cells divide by mitosis. Gametes are formed by meiosis.

Give **two** differences between mitosis and meiosis.

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(2 marks)

— 5

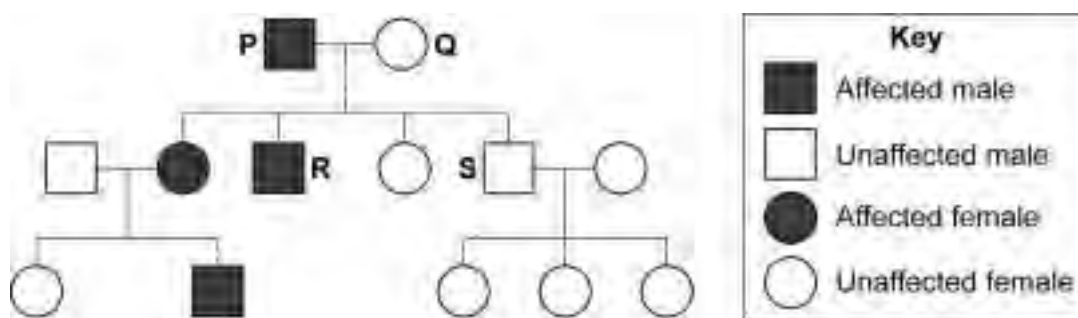
Turn over for the next question

Turn over ►

- 6** Sometimes babies are born with extra fingers or toes as shown in the photograph.
This condition is called polydactyly.



The diagram shows the inheritance of polydactyly in a family.



- 6 (a)** Polydactyly is caused by a dominant allele, **D**.
The recessive allele of the gene is represented by **d**.

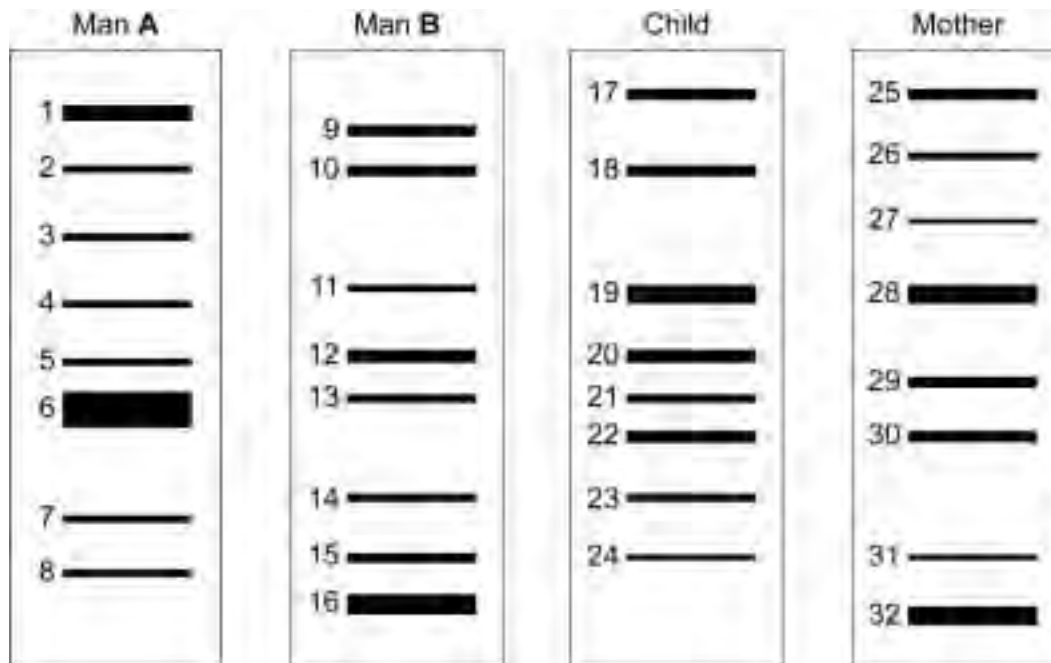
Use one genetic diagram to show the inheritance of the polydactyly gene by **R** and **S**.

(4 marks)

Question 6 continues on the next page

Turn over ►

7 DNA fingerprinting can be used to identify people. One example of the use of DNA fingerprinting is to find out which man is the father of a child. The diagram shows the DNA fingerprints of a child, the child's mother and two men who claim to be the child's father. The numbers refer to the bars on the DNA fingerprints.



7 (a) Only half the bars of the child's DNA fingerprint match the mother's DNA fingerprint. Explain why.

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(2 marks)

7 (b) Which man, **A** or **B**, is more likely to be the father of the child?

Use the numbers on the DNA fingerprints to explain your choice. In your answer you should refer to all four people.

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(3 marks)

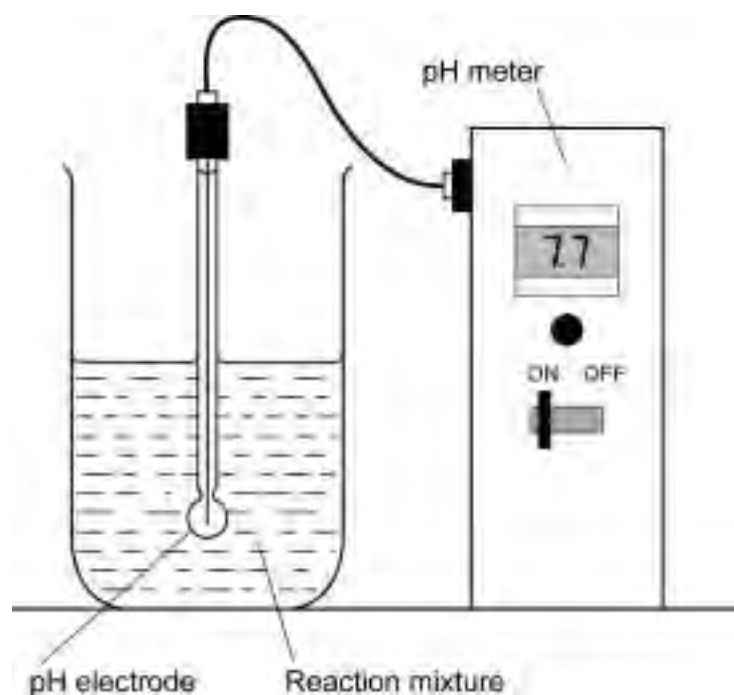
Turn over ►

8 The diagram shows the apparatus used to investigate the digestion of milk fat by an enzyme. The reaction mixture contained milk and the enzyme.

In Experiment 1, bile was also added.

In Experiment 2, an equal volume of water replaced the bile.

In each experiment, the pH was recorded at 2 minute intervals.



The results of the two experiments are given in the table.

Time in minutes	pH	
	Experiment 1: with bile	Experiment 2: without bile
0	9.0	9.0
2	8.8	9.0
4	8.7	9.0
6	8.1	8.8
8	7.7	8.6
10	7.6	8.2

8 (a) Milk fat is a type of lipid.

Explain why the pH changed in experiment 2.

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(2 marks)

8 (b) (i) For **Experiment 1**, calculate the average rate of fall in pH per minute, between 4 minutes and 8 minutes.

Show clearly how you work out your final answer.

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..... pH units per minute
(2 marks)

8 (b) (ii) The average rate of fall in pH per minute for Experiment 2 was 0.1 units of pH per minute.

Explain the difference in the rate of fall in pH when bile is present.

.....
.....

(1 mark)

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5

Turn over for the next question

Turn over ►

9 There is a large amount of evidence that evolution is taking place.

9 (a) Scientists are uncertain about how life started on earth.

Explain why.

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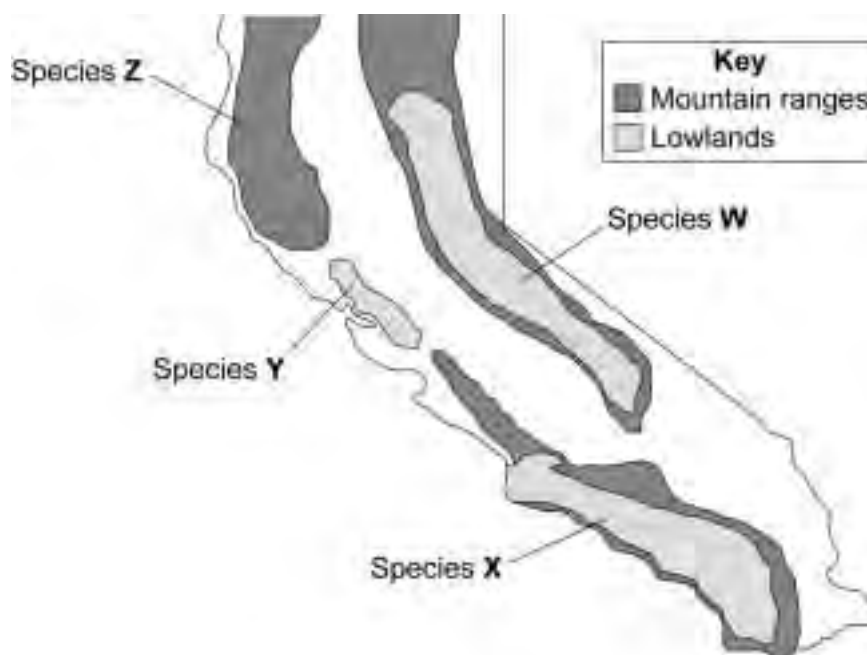
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(2 marks)

9 (b) Salamanders are terrestrial amphibians.

The diagram shows the distribution of four different species of salamander in a country.



Originally, there was only one species of salamander in the country.

Suggest an explanation for the development of the four different species.

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(5 marks)

7

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED**

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