

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

**Thursday 4 June 2020**

Morning (Time: 1 hour 30 minutes)

Paper Reference **WBI04/01**

**Biology**

**Advanced**

**Unit 4: The Natural Environment and Species Survival**

**You must have:**

Calculator, HB pencil, ruler

Total Marks

--

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*

## Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed  
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*
- Candidates may use a calculator.

## Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P64724A

©2020 Pearson Education Ltd.

1/1/1/1/1/1



Pearson

**Answer ALL questions.**

**Some questions must be answered with a cross ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

- 1** Cells contain different types of RNA, including messenger RNA (mRNA), transfer RNA (tRNA) and ribosomal RNA (rRNA).

(a) Describe the role of **mRNA** in protein synthesis.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

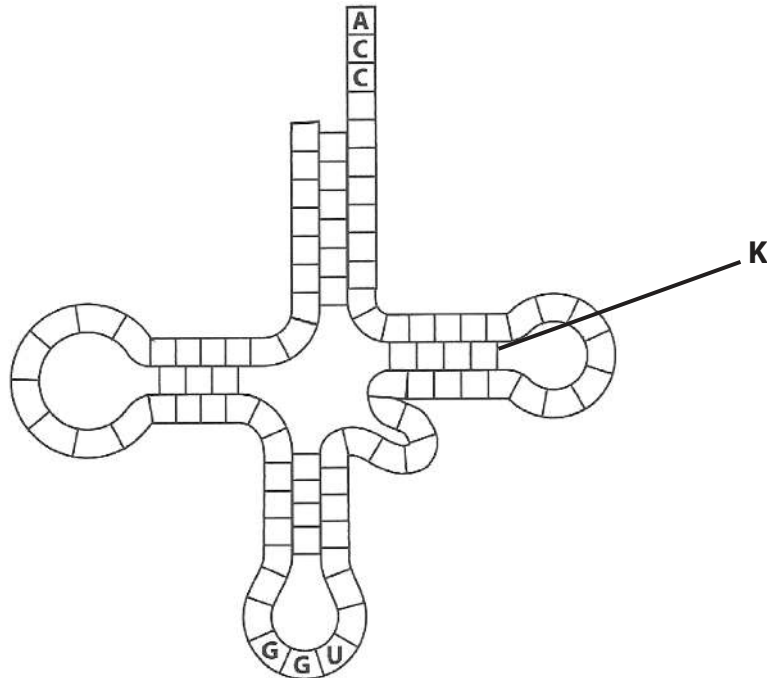
DO NOT WRITE IN THIS AREA



(b) A tRNA molecule is a single-stranded polynucleotide.

It is folded into a clover-leaf shape, held together by bonds between complementary bases. One of these bonds is labelled **K**.

The diagram below shows a tRNA molecule specific for the amino acid proline.



(i) Put a cross  in the box next to the name of the bond labelled **K**.

(1)

- A** ester
- B** hydrogen
- C** peptide
- D** phosphodiester

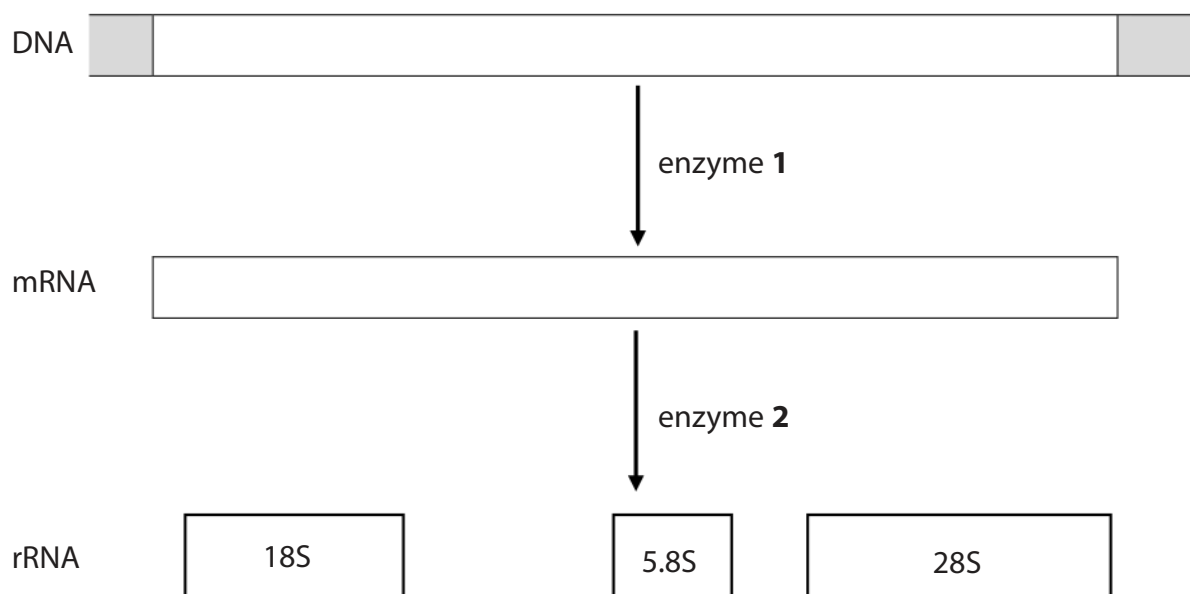
(ii) Put a cross  in the box next to the mRNA codon for this tRNA.

(1)

- A** CCA
- B** CCT
- C** TTG
- D** UGG



- (c) The diagram below shows how three different types of rRNA, 18S, 5.8S and 28S, are produced from mRNA.



- (i) Name the process shown in this diagram. (1)

- (ii) Put a cross  in the box next to the part of the cell where this process takes place. (1)

- A** cytoplasm
- B** Golgi apparatus
- C** nucleus
- D** rough endoplasmic reticulum (rER)



(iii) Put a cross ☒ in the box next to the name of enzyme 1.

(1)

- A DNA polymerase
- B reverse transcriptase
- C RNA polymerase
- D spliceosome

(iv) Put a cross ☒ in the box next to the name of enzyme 2.

(1)

- A integrase
- B reverse transcriptase
- C RNA polymerase
- D spliceosome

(v) Name the parts of the mRNA molecule removed by enzyme 2.

(1)

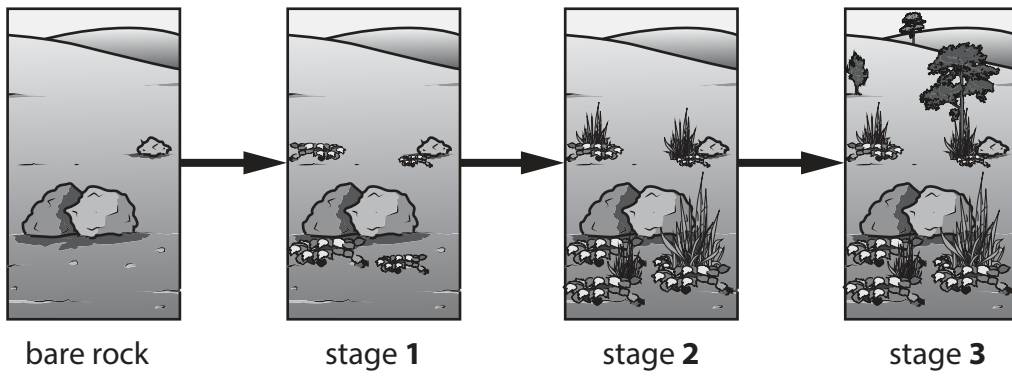
---

(Total for Question 1 = 10 marks)

---



2 The diagrams below show some stages that take place when bare rock becomes a climax community.



(a) Explain the meaning of the term **climax community**.

(2)

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(b) Using the information in the diagrams, explain the changes between stage 1 and stage 3.

(3)

(c) Explain what would happen if herbivores were introduced into the area at stage 2.

(4)

(Total for Question 2 = 9 marks)

DO NOT WRITE IN THIS AREA



3 The body responds to viral infections with the non-specific response and the immune response.

(a) State what is meant by the term **viral infection**.

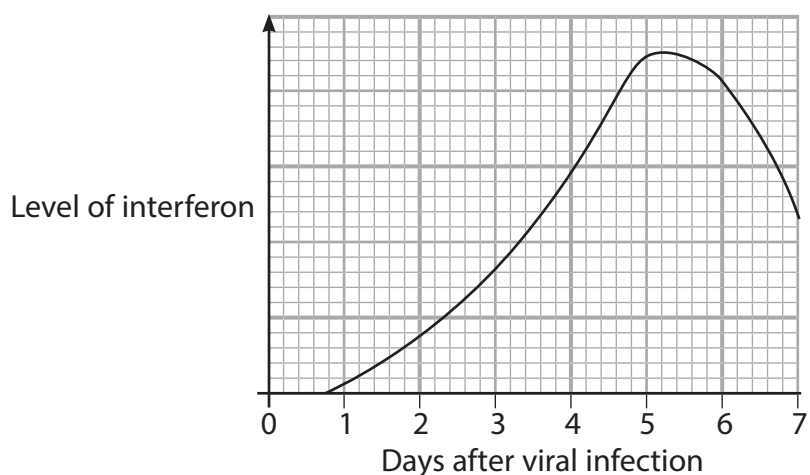
(1)

.....

.....

.....

(b) The graph below shows the levels of interferon in a person during a viral infection.



Explain the changes in the level of interferon from day 0 to day 7.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





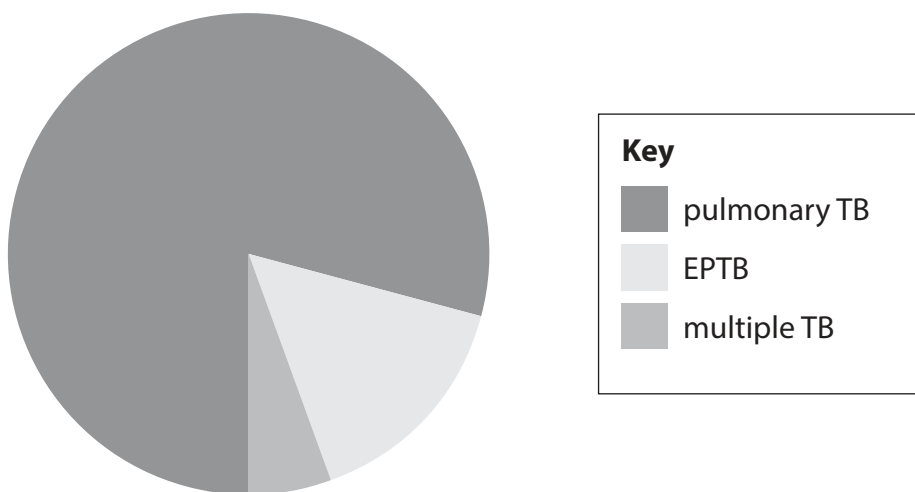


4 *Mycobacterium tuberculosis* causes the disease tuberculosis (TB).

The table below shows one way of classifying TB.

Type of TB	Description of where the disease affects
pulmonary	lungs only
extra-pulmonary (EPTB)	organs other than the lungs
multiple	lungs and then at least one other organ

(a) The pie chart below shows the incidence of these three types of TB in one population of people.



Using the information in the pie chart, compare the incidence of these three types of TB.

(2)

.....

.....

.....

.....

.....

.....





(c) Suggest how multiple TB occurs and results in death.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**(Total for Question 4 = 11 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

5 Ticks are small animals that feed on the blood of other animals. The tick bites the skin and sucks out blood.

The photograph below shows a tick feeding.



Magnification  $\times 10$

(Source: © Zoonar GmbH/Alamy Stock Photo)

When an animal is bitten by a tick, chemicals called chemokines are released by cells in the skin.

Chemokines attract white blood cells into the area of the bite.

The saliva of the tick contains proteins, called evasins, that inhibit chemokines and reduce inflammation. This allows the tick to feed for longer.

(a) Suggest why reducing inflammation allows the tick to feed for longer.

(2)

.....

.....

.....

.....

.....

.....



(b) Scientists have synthesised two different types of evasin, E1 and E2.

The number of amino acids in E1 is 98. The molecular mass of this evasin is 10.9 kDa.

The number of amino acids in E2 is 80.

(i) Calculate the predicted molecular mass of E2. (2)

Answer ..... kDa

(ii) The actual molecular mass of E2 was found to be greater than the predicted value.

Explain why the actual molecular mass is different from the predicted value. (2)

.....

.....

.....

.....

.....

.....

(iii) The scientists joined these two evasins together to form E3.

Suggest how the scientists joined E1 and E2 together. (2)

.....

.....

.....

.....

.....

.....





6 Basking sharks are an endangered species.

These sharks can be seen in the water or identified by their fin sticking out of the water.

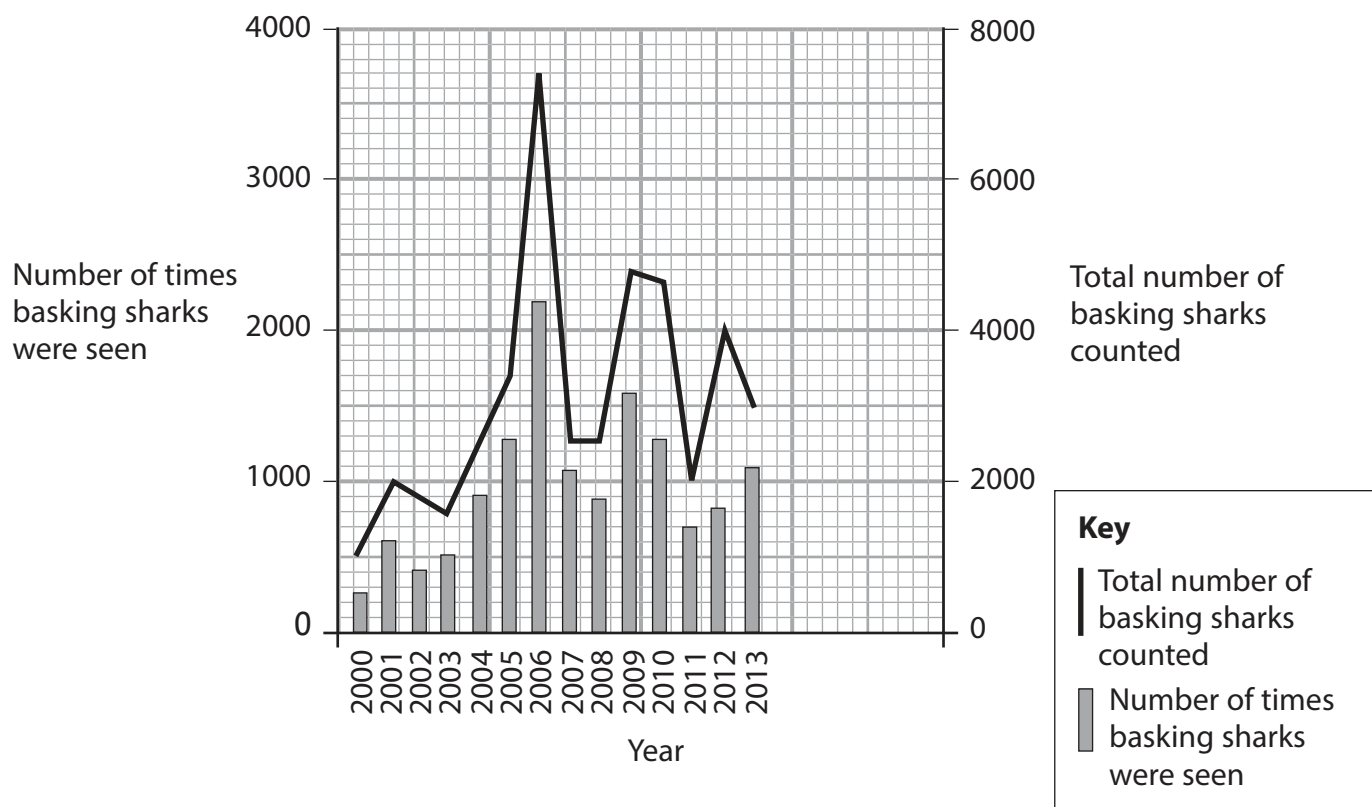
The photograph below shows a basking shark.



Magnification  $\times 0.01$

(Source: © Chris Gomersall/Alamy Stock Photo)

(a) The graph below shows the number of times basking sharks were seen and the total number of basking sharks counted around the coast of the UK, from 2000 to 2013.





(i) State why, in any one year, the number of times basking sharks were seen is not equal to the number of sharks counted.

(1)

(ii) Suggest **two** reasons why the number of times basking sharks were seen fluctuates over the years.

(2)

(iii) Using the information in the graph, state how many basking sharks could be seen in 2015.

Explain how you arrived at this number.

(2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 6 4 7 2 4 A 0 1 7 2 8

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) Scientists used DNA profiling to determine the genetic diversity of the population of basking sharks.

(i) Describe how DNA profiling could be carried out to determine the genetic diversity of these sharks.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



(ii) Explain why scientists are concerned about the genetic diversity of these sharks.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**(Total for Question 6 = 12 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

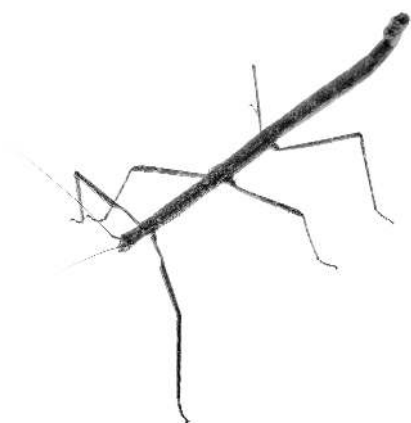
DO NOT WRITE IN THIS AREA



7 Evidence from ecological field studies can be supported by laboratory investigations.

Stick insects can be kept in a school laboratory in a tank. Most stick insects are females and lay eggs readily in captivity.

The photograph below shows a stick insect. The diagram shows stick insects kept in a laboratory.

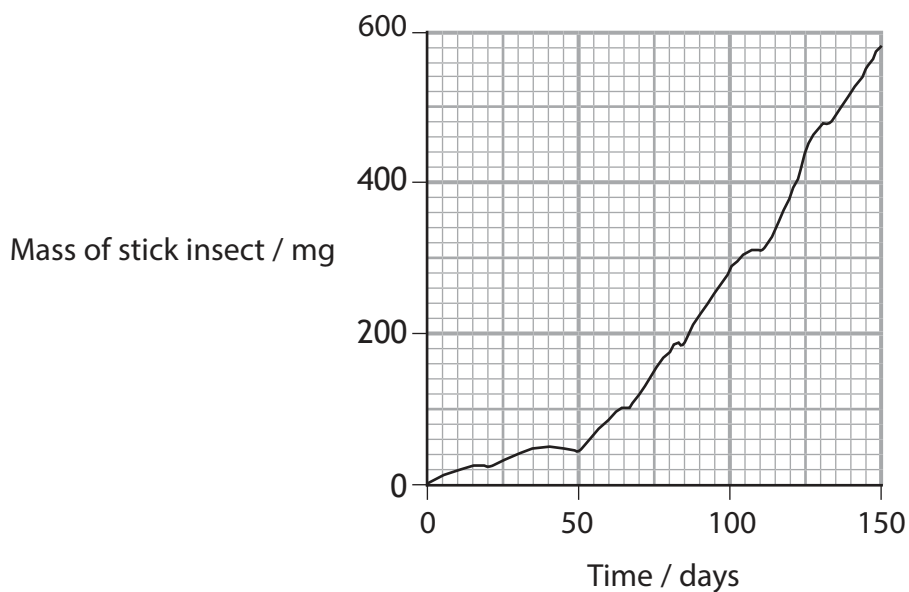


Magnification  $\times 1$

(Source: © Nature Picture Library/Alamy Stock Photo)

A student suggested that the increase in mass of a stick insect would be the same as the mass of leaves that it ate.

The graph below shows the mass of a stick insect recorded each day for 150 days.



(a) Calculate the mean daily increase in mass of this insect from day 10 to day 130. (2)

Answer ..... mg

(b) From day 10 to day 130, the stick insect ate 5 g of leaves.  
Calculate the efficiency of mass transfer between trophic levels 1 and 2. (2)

Answer ..... %

(c) (i) Suggest **two** reasons why the increase in mass of this stick insect is less than the mass of leaves that it ate. (2)

.....

.....

.....

.....

.....

.....







(ii) Explain why growing bamboo could reduce global warming.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

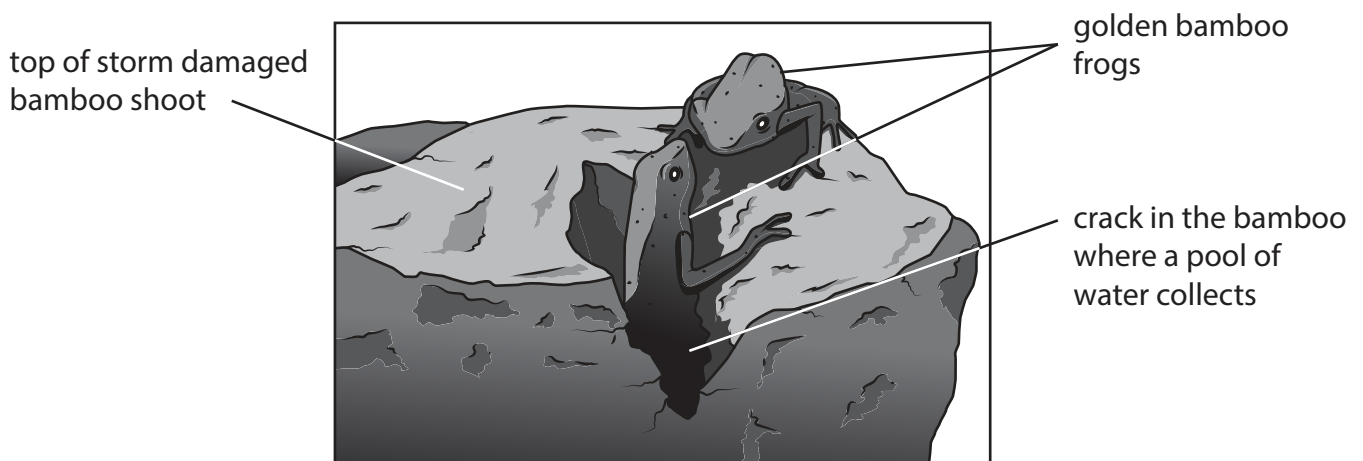
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) The golden bamboo frog is endemic to a very dry part of Madagascar.

This frog lays its egg in a small pool of water that collects in a storm damaged bamboo shoot.

The diagram below shows two golden bamboo frogs on top of a storm damaged bamboo shoot.







DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**

