

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

BIOLOGY

2805/05

Mammalian Physiology and Behaviour

Friday

23 JUNE 2006

Afternoon

1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name

Centre Number

Candidate
Number

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TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	5	
2	14	
3	15	
4	17	
5	11	
6	17	
7	11	
TOTAL	90	

This question paper consists of 19 printed pages and 1 blank page.

Answer **all** the questions.

1 (a) Describe what is meant by mechanical digestion.

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(b) Chemical digestion is the result of the action of a variety of enzymes on food molecules.

Explain the difference in the mode of action of endopeptidases and exopeptidases.

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[Total: 5]

- 2 Cholesterol molecules are transported in the blood as lipoproteins. Some lipoproteins are high density lipoproteins (HDLs) and others are low density lipoproteins (LDLs).

The liver regulates the blood cholesterol concentration.

A high blood cholesterol concentration indicates that a person's health may be at risk.

Cholesterol also has many beneficial functions in the body.

- (a) Outline the functions of cholesterol in the body.

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- (b) State a major health risk to people who have a high blood cholesterol concentration.

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Blood tests were carried out on five people, **A**, **B**, **C**, **D** and **E**, early in the morning before they had eaten anything. Their total blood cholesterol concentration was measured, as was the concentration of HDLs and LDLs.

- (c) Suggest why the people were required **not** to eat before the blood test.

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Fig. 2.1 shows the results of the cholesterol tests.

Table 2.1 displays the results of the HDL and LDL tests and the ratio of HDL to LDL.

All concentrations were measured in mmol dm^{-3} .

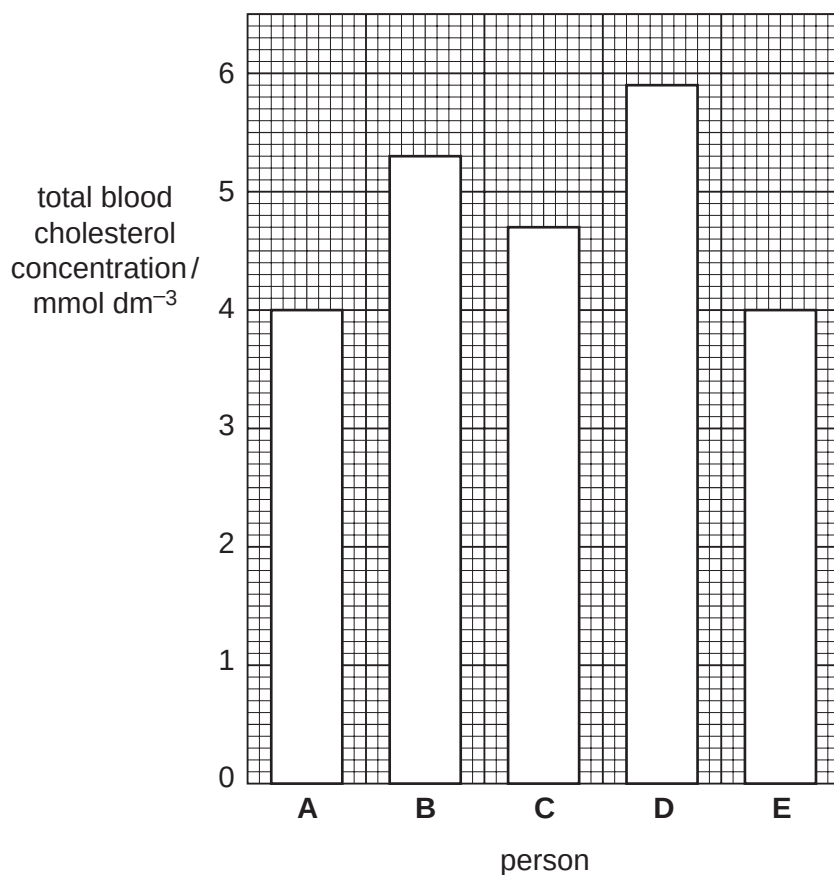


Fig. 2.1

Table 2.1

person	HDL concentration / mmol dm^{-3}	LDL concentration / mmol dm^{-3}	ratio HDL : LDL
A	1.60	2.40	0.67 : 1
B	1.50	3.80	0.39 : 1
C	1.50	3.20	0.47 : 1
D	1.65	4.25	
E	1.75	2.25	

- (d) Calculate the HDL : LDL ratios for persons **D** and **E**. Write your answers in the shaded spaces in Table 2.1. [2]

- (e) The desirable range for total blood cholesterol is 4.0 to 5.0 mmol dm⁻³. The ratio of HDL concentration to LDL concentration is a reliable indicator of health.

Using the information in Fig. 2.1 and Table 2.1, compare the results of **A** and **D** with regards to potential health risks.

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- (f) There are drugs, such as statins, that act to lower blood cholesterol concentration.

Statins act as inhibitors of a coenzyme that is involved in the synthesis of cholesterol in liver cells.

Suggest **other** ways in which drugs may act to lower the cholesterol concentration in the blood.

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..... [2]

[Total: 14]

- 3 All bats communicate using a variety of squeaks and squeals that human ears can hear. Bats in the taxonomic group Microchiroptera, such as the one in Fig. 3.1, emit high frequency sounds for echolocation. Even though low frequency sounds travel further, only high frequency sound waves used for echolocation can provide detailed information about tiny objects such as flying insects. These high frequency sounds, which range from 20 to 200 kHz, are beyond the range of human hearing.

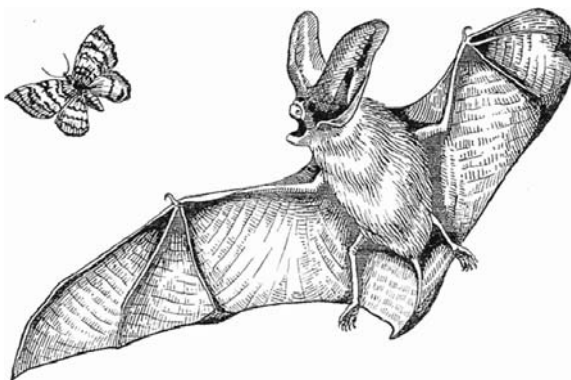


Fig. 3.1

- (a) State **precisely** where high frequency sounds are detected in the mammalian ear.

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 [2]

- (b) Using the information in the passage and Fig. 3.1, suggest how a bat, in flight, may locate a flying insect.

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 [3]

- Name the **three** bones that are separated as the bat emits its sound.

1

2

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[1]

- Bats and other mammals require a keen sense of balance.

Describe the role played by a mammal's ears in providing its brain with information about the **position and movement** of the head.

[illegible]

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Quality of Written Communication [1]

[Total: 15]

- 4 (a) The pancreas is a gland that has both endocrine and exocrine functions.

Fig. 4.1 shows a section through part of the pancreas.

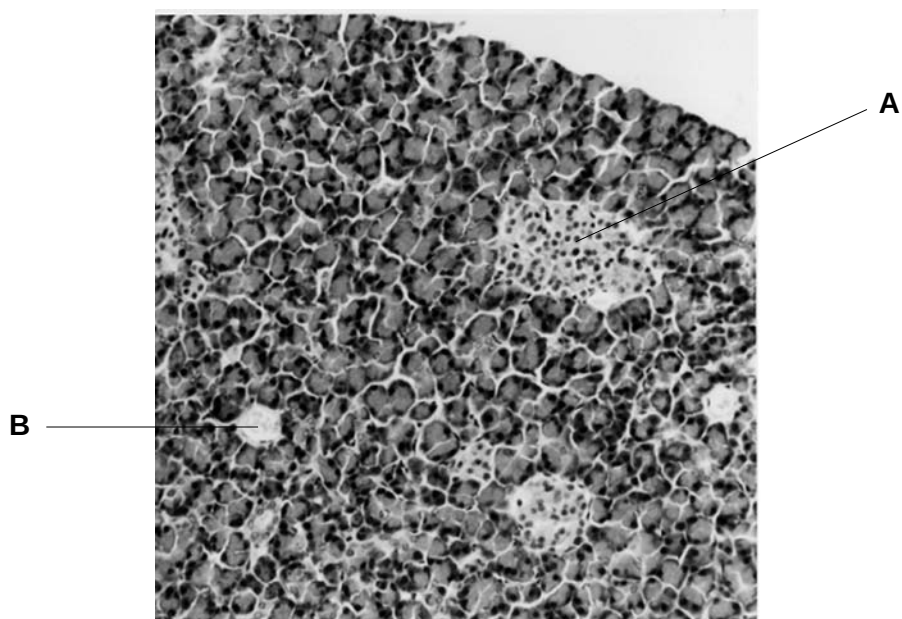


Fig. 4.1 magnification $\times 400$

- (i) Name **A** and **B**.

A

B [2]

- (ii) Explain the difference between the terms *endocrine* and *exocrine* with regard to the pancreas.

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- (b)** The secretion of pancreatic juice is coordinated with the arrival of food in the duodenum.

Describe how this coordination is achieved.

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- (c)** Acute pancreatitis can occur as a result of gallstones that block the pancreatic duct. The pancreas becomes inflamed and may produce symptoms such as upper abdominal pain, fever and vomiting. The disease is diagnosed by blood tests that indicate the presence of lipase and amylase. Treatment includes a course of anti-inflammatory drugs and surgery to remove the gallstones.

- (i)** Describe the usual action of lipase and amylase.

lipase

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amylase

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..... [3]

- (ii)** Suggest a different method of diagnosing a blocked pancreatic duct.

..... [1]

- (iii) If the pancreatic duct remains blocked for too long without treatment, pancreatic juice may damage the pancreas itself.

Explain how this may happen.

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[Total: 17]

- Describe how the central nervous system is protected from **mechanical** damage.

..... [3]

- The autonomic nervous system contains neurones that carry impulses to the internal organs.

Describe the role of the autonomic nervous system in the control of the heart beat.

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Quality of Written Communication [1]

[Total: 11]

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6 Compact bone makes up the outer layers of many bones.

- It consists of both organic and inorganic components.
- Its main organic component is collagen.
- Its main inorganic component is calcium phosphate.

(a) Describe **and** explain the main properties of collagen and calcium phosphate in bone.

collagen

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calcium phosphate

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..... [4]

(b) Describe how collagen is made in bone.

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(c) State **two** uses of calcium ions in the body, other than in bone and teeth formation.

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- 2
- [2]

The movement of calcium and phosphate ions between blood and bone cells is controlled by two hormones, calcitonin and parathormone (parathyroid hormone).

Fig. 6.1 outlines how this occurs.

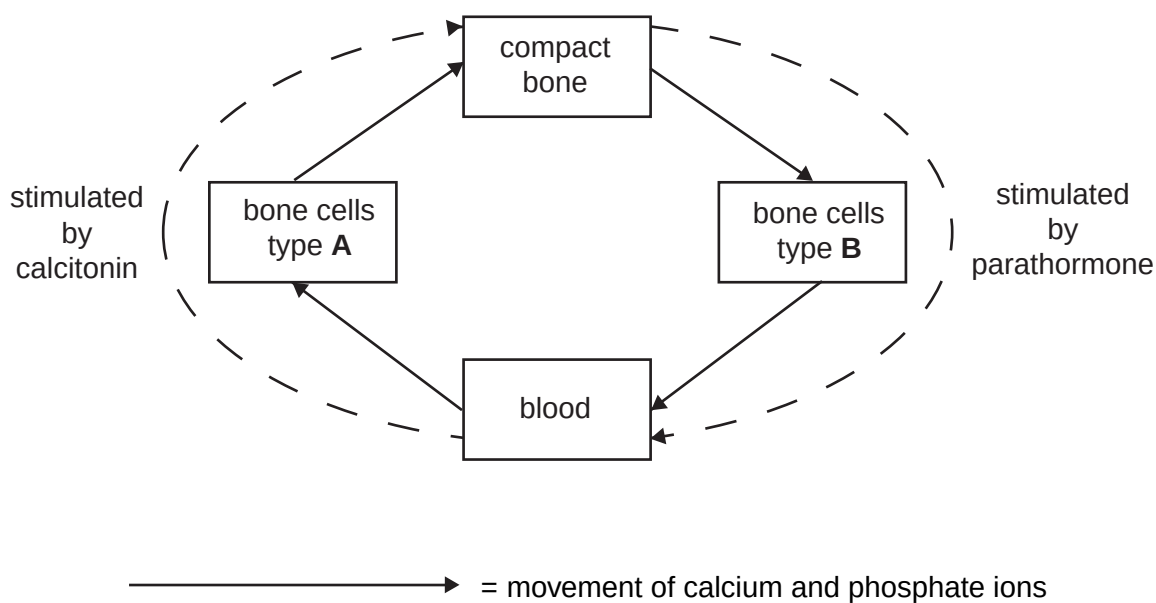


Fig. 6.1

(d) Name bone cells **A** and **B**.

- A**
- B**

[2]

(e) Osteoporosis is a degenerative disease that results from a disruption of the mechanisms outlined in Fig. 6.1. This causes a reduction in bone density, which may lead to a break or fracture. Post-menopausal women are more likely than men or pre-menopausal women to develop this disease because they no longer produce oestrogen.

(i) Using the information in Fig. 6.1, suggest how the absence of oestrogen may cause osteoporosis.

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(ii) Describe ways in which women may reduce the risk of developing osteoporosis.

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[Total: 17]

- 7 (a) Wolfgang Kohler carried out many investigations to test the behaviour of chimpanzees.

Describe briefly the general conclusions of his work.

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- (b) Fig. 7.1 shows an apparatus called a double-choice learning box with sound-proofed walls and doors.

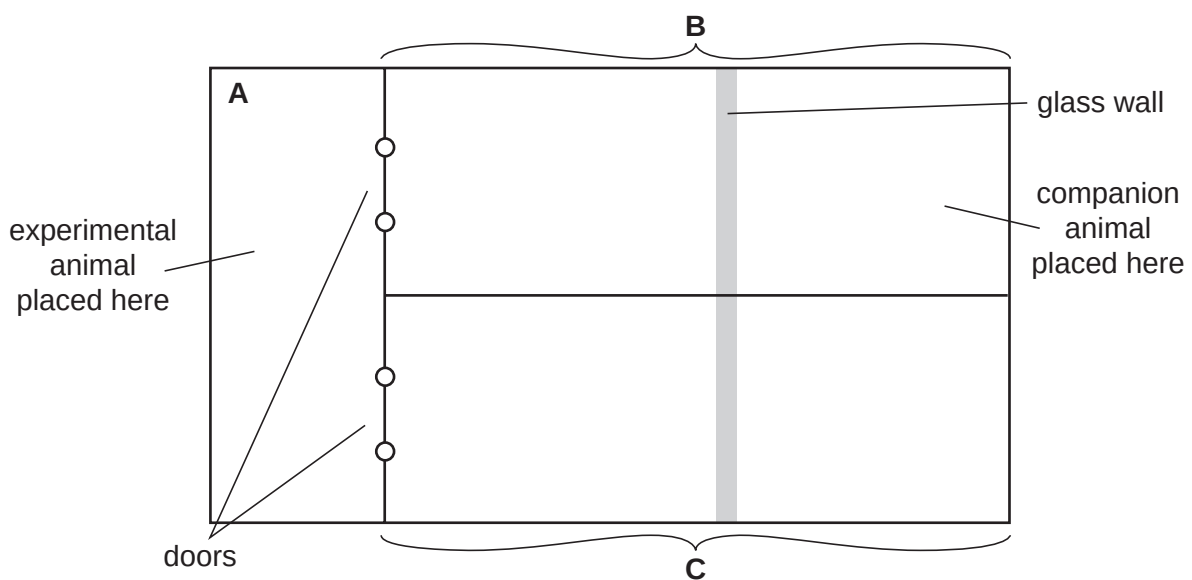


Fig. 7.1

- Two young mice were kept in separate, identical home cages and were accustomed to being handled.
- One mouse was used as the experimental subject and the other acted as a companion.
- The companion mouse was placed in chamber **B** behind a glass wall.
- Chamber **C** was left empty.
- The experimental mouse was placed in chamber **A** and the stop clock was started.
- The time taken for the experimental mouse to enter chamber **B** or **C** was noted.
- The experimental mouse was allowed to explore chamber **B** or **C** for 10 seconds and was then removed.
- The experiment was repeated a further 14 times with the same two mice.

Fig. 7.2 shows the results of this experiment.

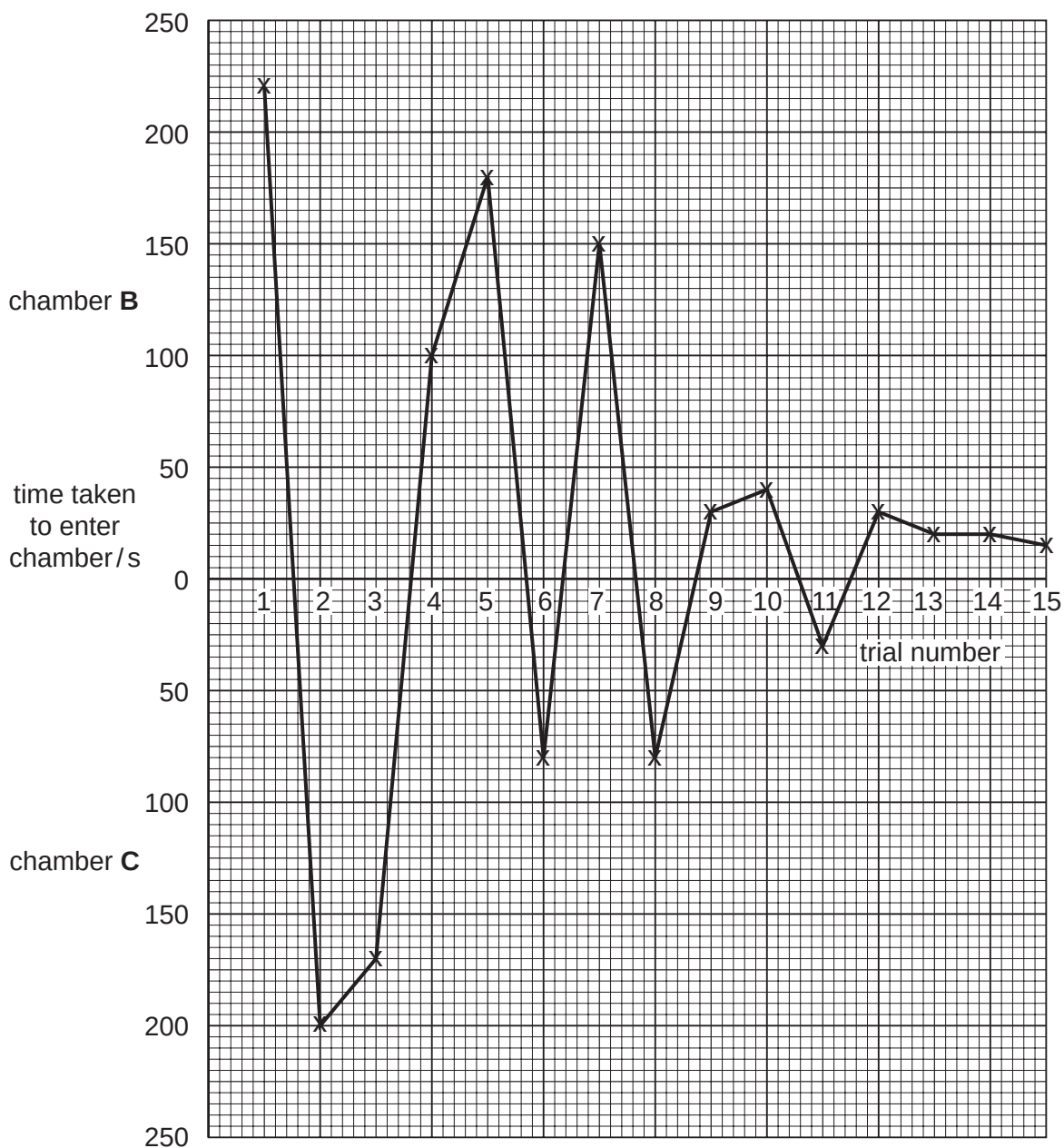


Fig. 7.2

(i) Using information in Fig. 7.2, describe the results of this investigation.

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(ii) Describe how you would carry out a control experiment for this investigation.

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(iii) Suggest the results you would expect from such a control experiment.

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(iv) State what type of learning has taken place in this investigation **and** explain how this type of learning differs from classical conditioning.

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..... [3]

[Total: 11]

END OF QUESTION PAPER

Copyright Acknowledgements:

Q3. Fig. 3.1 drawing of bat from *Life of Vertebrates*, p.589, fig. 368, published by Oxford University Press.

Q4. Fig. 4.1 © Biophoto Associates.

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