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Candidate Number

Biology

Assessment Unit A2 1

assessing

Module 4: Co-ordination, Biochemistry and Environment

[A2B11]



TUESDAY 19 JANUARY, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all eight** questions.

You are provided with **Photograph 4.6** for use with Question 6 in this paper.

Do not write your answer on this photograph.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Section A carries 60 marks.

Section B carries 15 marks.

You should spend approximately **20 minutes** on Section B.

You are expected to answer Section B in continuous prose.

Quality of written communication will be assessed in **Section B**.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Total Marks	
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Section A

1 All animals respond in some way when exposed to high environmental temperatures.

(a) Describe **two** ways in which an endotherm (homoiotherm) may respond to high environmental temperatures and, in each case, explain how this regulates body temperature.

1. _____

2. _____

_____ [4]

(b) Describe **two** ways in which an ectotherm (poikilotherm) may respond to high temperatures.

1. _____

2. _____

_____ [2]

2 Read the passage below and then answer the questions which follow.

The release of various gases into the atmosphere gives concern for human health and environmental well-being. Oxides of nitrogen represent one of eight gases for which the government has established an air quality standard as part of its national Air Quality Strategy.

Nitrogen dioxide (NO_2) is primarily released from fuel combustion, with road vehicle emissions being a major source in urban areas. It dissolves in water to form nitric acid and contributes to acid rain with a pH significantly less than 5. Exposure to high levels of nitrogen dioxide causes severe lung injury, while acid rain may result in prolonged damage to the environment, frequently far from the source of the pollution.

Nitrous oxide (N_2O) is mainly produced in the soil as a result of the activity of denitrifying bacteria. The increased use of artificial nitrate fertilisers has undoubtedly led to more nitrous oxide in the atmosphere. Nitrous oxide is a “greenhouse” gas, and is also implicated in “ozone” depletion.

(a) Suggest **one** other gas, released from fuel combustion, that is included in the government’s Air Quality Strategy.

_____ [1]

(b) Outline how acid rain can cause prolonged environmental damage.

_____ [2]

(c) Describe the process of denitrification.

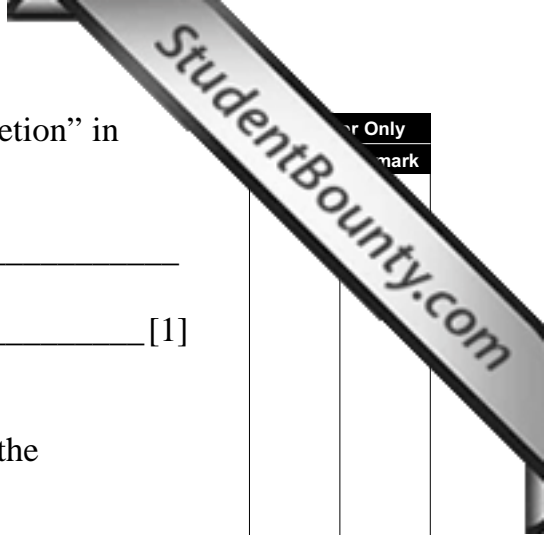
_____ [2]

(d) Distinguish between “greenhouse effect” and “ozone depletion” in terms of their consequences.

[1]

(e) State **one** environmental problem, other than pollution of the atmosphere, arising from the use of artificial fertilisers.

[1]



For Only
mark

- 3 The movement of auxin through segments of shoot was studied by placing an agar block containing auxin (■) at one end and an “empty” block (□) at the other end. The following experiments were carried out with
- agar blocks containing auxin at the top or bottom of the shoot segment
 - shoot segments either the “right-way-up” or “upside-down”.

During the experiments the “empty” agar block acted as “receiving” block for any auxin that moved through the shoot segment during a 24-hour period. This **initial set up** is shown in the diagrams below.

The “receiving” agar block was then placed asymmetrically on a freshly decapitated shoot as shown in the diagrams as **subsequent treatment**.

Any resulting curvature was observed as shown in the diagrams as **final result**.

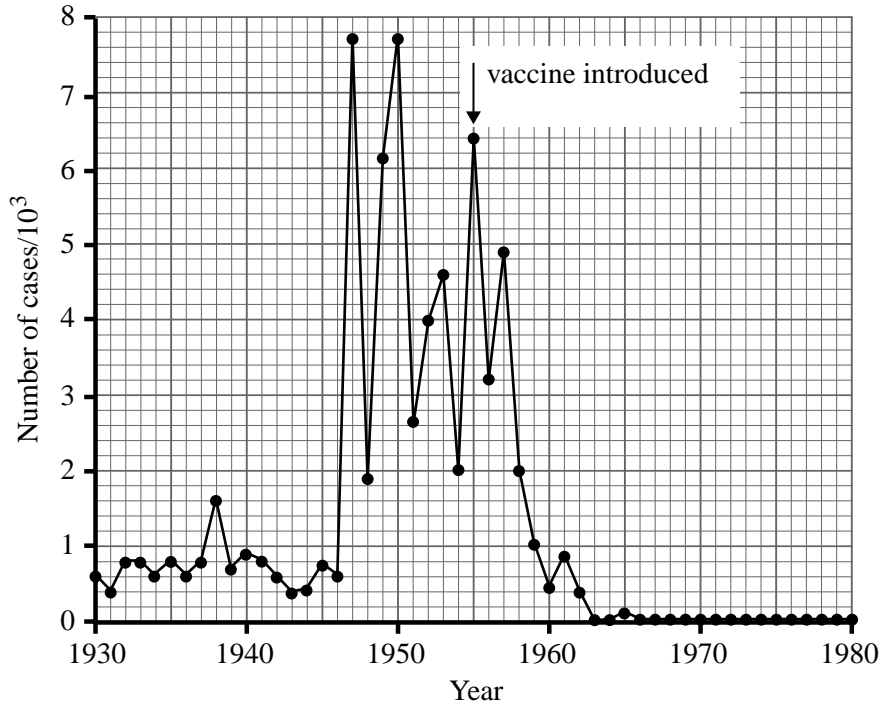
Experiment	Initial set-up	Subsequent treatment	Final result
1	<p>auxin block on top</p> <p>Shoot “right-way-up”</p>		
2	<p>auxin block on top</p> <p>Shoot “upside-down”</p>		
3	<p>auxin block below</p> <p>Shoot “right-way-up”</p>		
4	<p>auxin block below</p> <p>Shoot “upside-down”</p>		

(a) Explain the final result of experiment 1.

(b) Identify the trends for auxin movement evident from the results of all **four** experiments, and suggest an explanation for these.

(c) Experiment 1 was repeated in an atmosphere lacking oxygen. The final result showed no curvature. Suggest an explanation for this result.

4 Poliomyelitis (polio) is a highly infectious viral disease that may attack the motor neurones of the central nervous system, and cause paralysis and death. Although polio has plagued humans since ancient times, its most extensive outbreak occurred during the middle of the past century. The graph below shows the incidence of polio in Britain over a fifty-year period.



(a) Vaccination was introduced in 1955. Calculate the percentage decrease in the number of cases in the first year of vaccination. (Show your working in the space below.)

Answer _____ [2]

(b) The vaccine contains weakened (attenuated) virus particles. Explain how this may result in long-term immunity.

[3]

(c) The vaccination programme involves a first dose shortly after birth, and then three further doses prior to school entry. Explain why more than one dose of the vaccine is necessary.

[2]

(d) The last naturally-occurring case of polio in Britain was in 1982 though it remained common in many other countries. Then, in 1988 the World Health Organisation commenced a worldwide vaccination programme in an attempt to eradicate polio. As a consequence, the incidence of polio has dropped by over 99% and the disease is now naturally found in only six countries. Explain why it is still necessary to vaccinate all children in Britain.

[2]

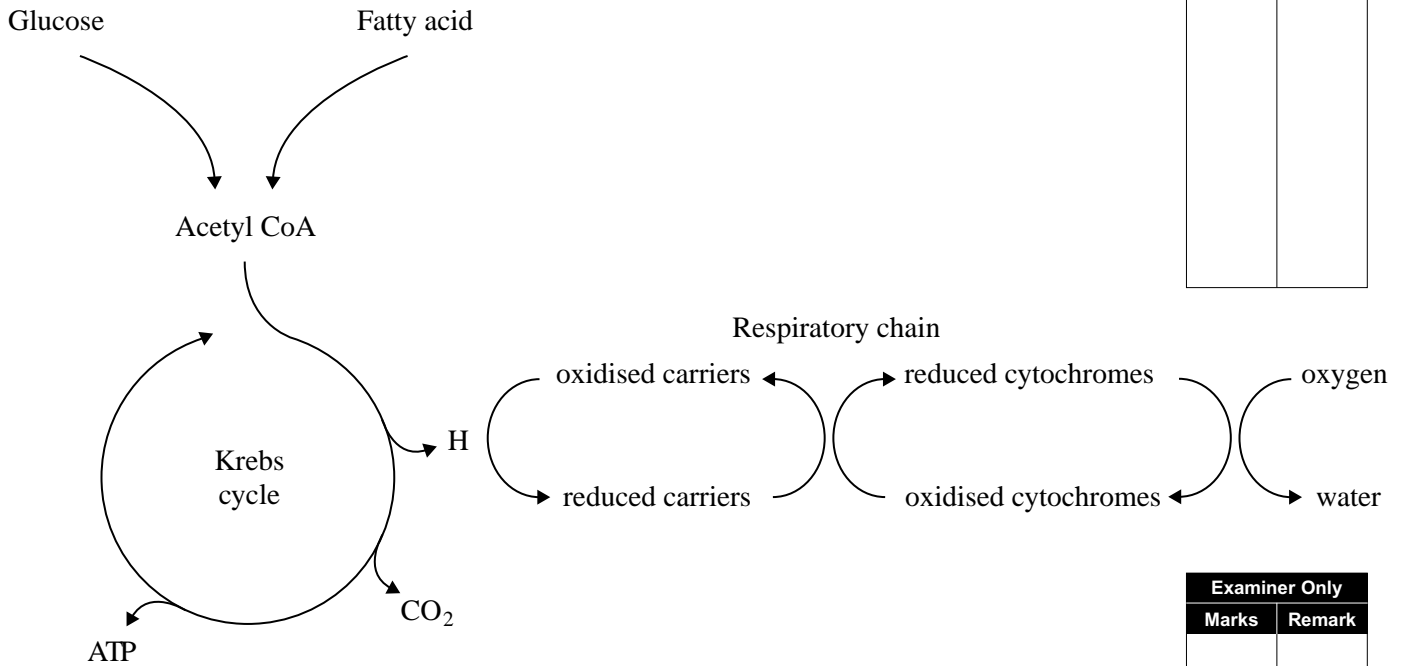
5 The two substrates most frequently used in respiration are glucose and fatty acids.

(a) The reason for two main respiratory substrates is that each holds a particular advantage over the other. State **one** advantage of using glucose and fatty acids as respiratory substrates.

- Glucose _____

- Fatty acids _____
_____ [2]

The diagram below summarises the aerobic respiration of glucose and fatty acids.



(b) Explain how the respiratory chain results in the synthesis of ATP.

- _____
- _____
- _____
- _____
- _____
- _____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

Exercising muscle has a high demand for oxygen as more ATP is required for muscle contraction.

(c) State **three** mechanisms within the body by which extra oxygen might be obtained by the muscle tissue.

1. _____

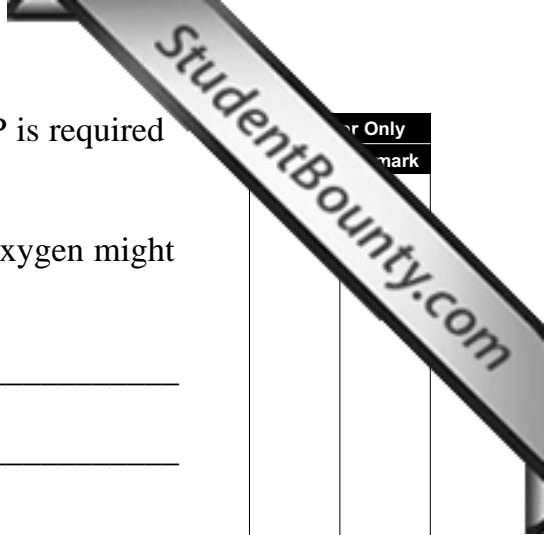
2. _____

3. _____

_____ [3]

(d) During strenuous exercise huge amounts of ATP are required. Explain how this amount of ATP is generated during strenuous exercise.

_____ [1]



Mark	Only
mark	

6 **Photograph 4.6** is an electronmicrograph of mammalian striated muscle in a relaxed state.

(a) Identify the features labelled **A** to **E**.

A _____

B _____

C _____

D _____

E _____

[5]

(b) The electronmicrograph shows muscle in a relaxed state. Identify **two** changes that would be apparent if the muscle was in a contracted state.

1. _____

2. _____

_____ [2]

(c) Identify the role of each of the following during muscle contraction.

- Sarcoplasmic reticulum/T-system

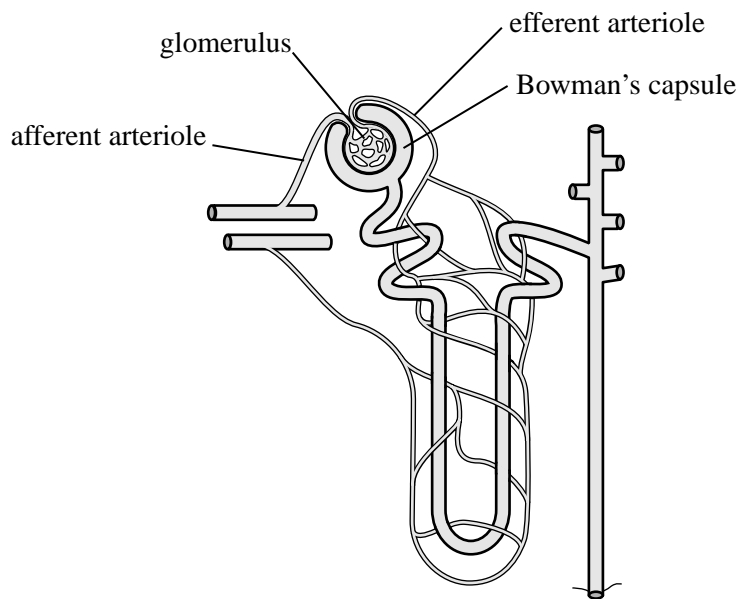
- Adenosine triphosphate (ATP)

_____ [2]

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(Questions continue overleaf)

7 The diagram below shows a nephron, collecting duct and associated blood vessels, the functional units in the production of urine. Ultrafiltration takes place between the glomerulus and the Bowman's capsule.



(a) Following ultrafiltration, various substances are reabsorbed before urine is produced. Outline the processes involved in the reabsorption of substances and the respective location of each within the nephron and collecting duct.

[3]

(b) Atrial natriuretic peptide (ANP) is a hormone that dilates the afferent arteriole and constricts the efferent arteriole.

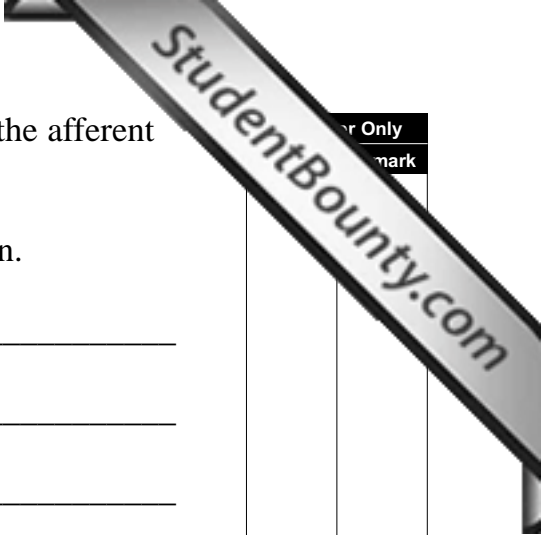
(i) Explain the effects of ANP on the rate of ultrafiltration.

[2]

ANP is released from the atria of the heart in response to high blood pressure.

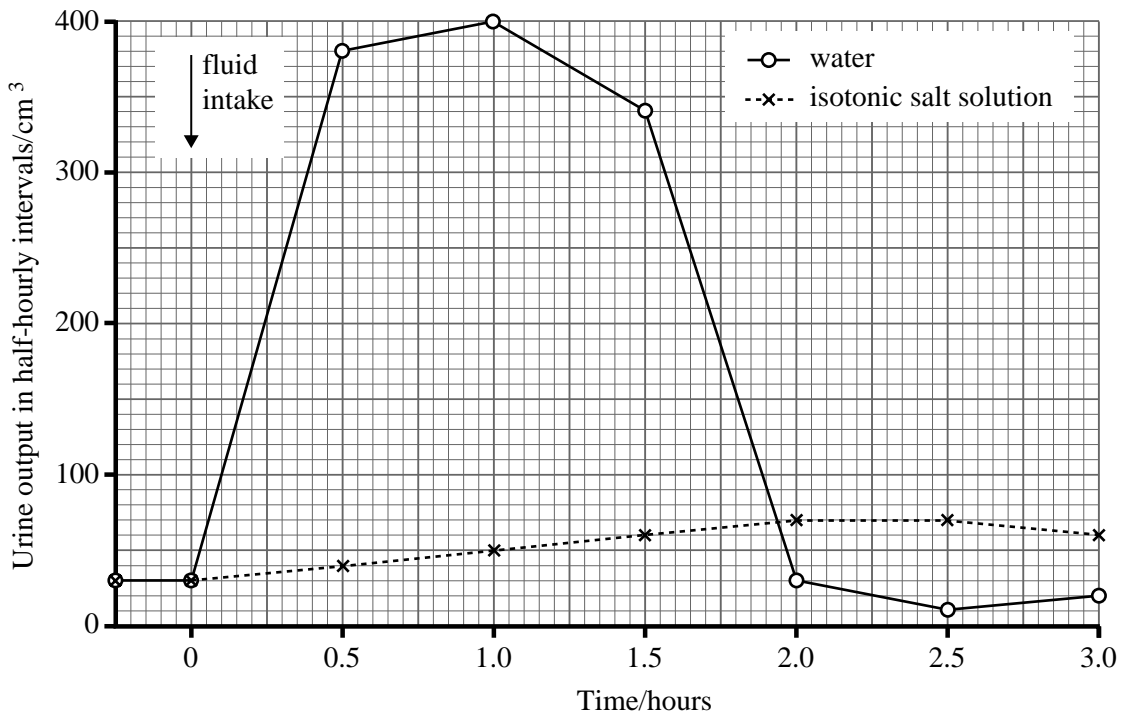
(ii) Suggest how ANP controls blood pressure.

[2]



For Only
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(c) Two groups of students were given 1 dm^3 of fluid to drink and urine production was measured every half-hour over a period of 3 hours. The students in one group were given water to drink while the others were given isotonic (iso-osmotic) salt solution to drink. The results are shown in the graph below.

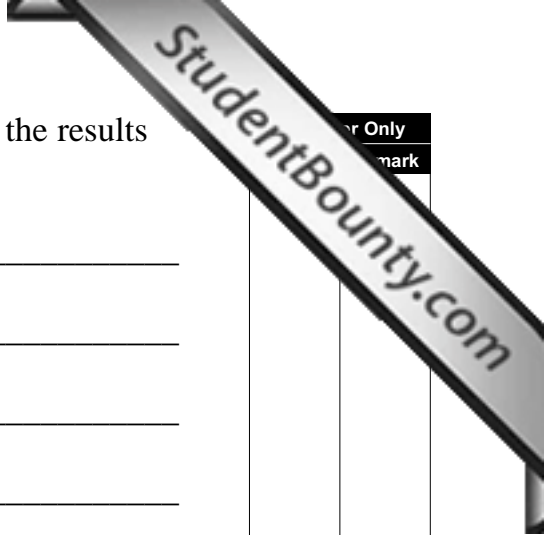


(i) Drinking fluid will result in an increase in blood pressure. Using the information in part (b), explain the results of the group given isotonic salt solution to drink

[2]

(ii) Using your understanding of osmoregulation, explain the results shown of the group given water to drink.

[4]

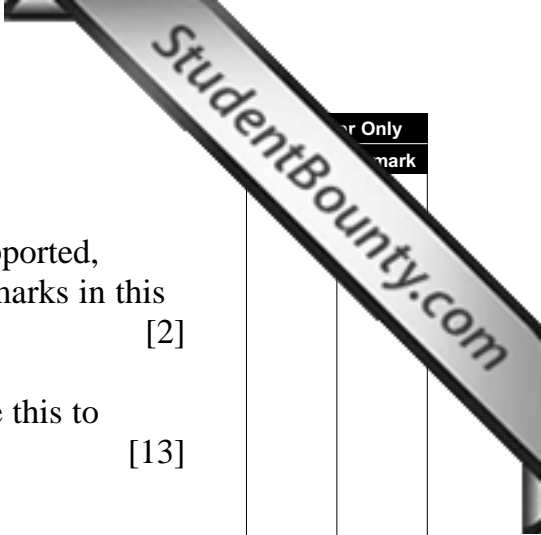


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Section B

In this section you are expected to answer in continuous prose, supported, where appropriate, by diagrams. You are reminded that up to two marks in this question are awarded for the quality of written communication. [2]

8 Give an account of the biochemistry of photosynthesis and use this to explain how certain environmental factors limit its rate. [13]



For Only
mark

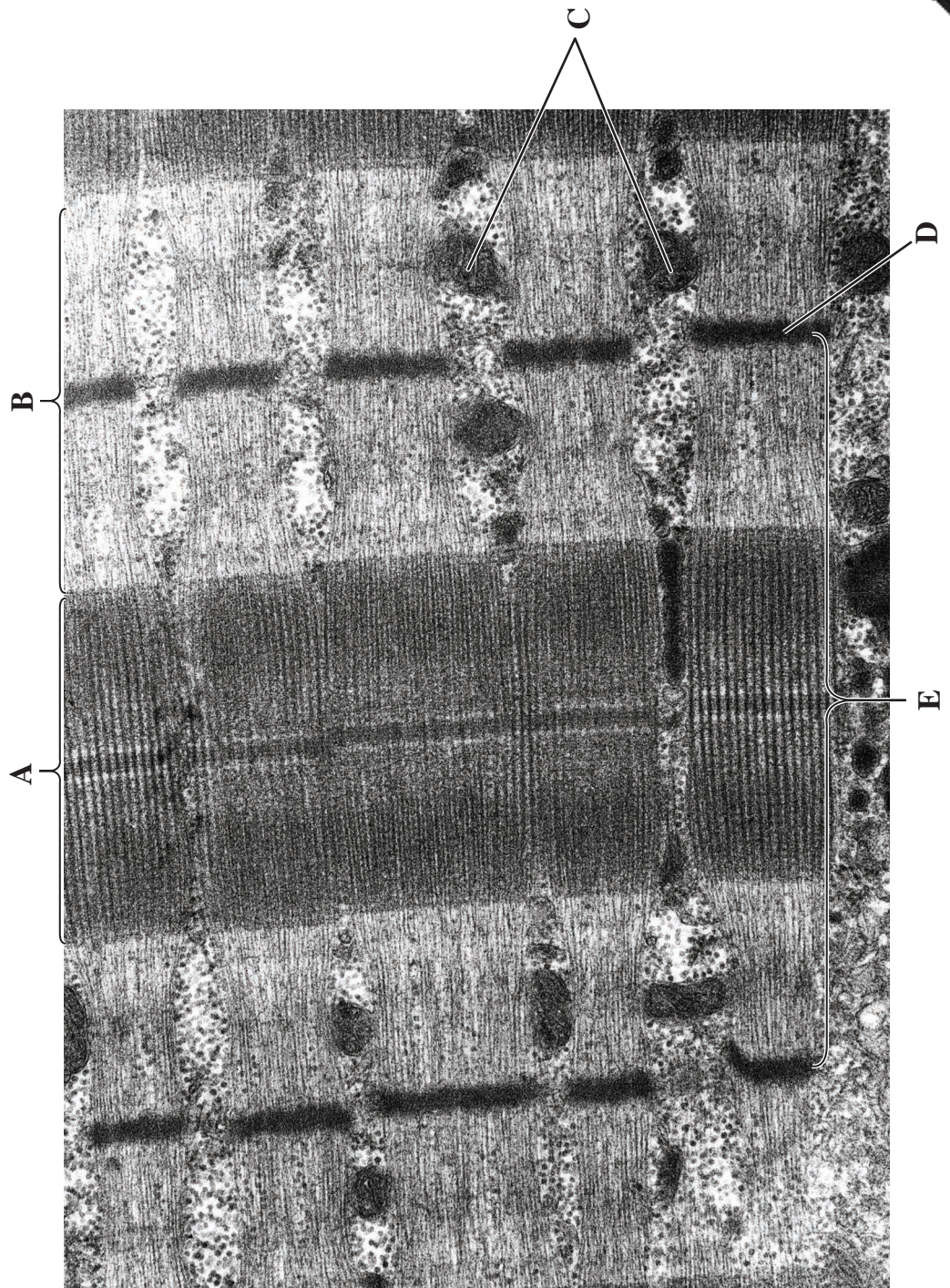
Lined writing area consisting of 30 horizontal lines.

Vertical margin box on the right side of the page, divided into two columns.

THIS IS THE END OF THE QUESTION PAPER

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will be happy to rectify any omissions of acknowledgement in future if notified.

Photograph 4.6 (For use with Question 6)



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