

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Education
June 2007
Advanced Subsidiary Examination



**BIOLOGY (SPECIFICATION B)
Unit 3 Physiology and Transport**

BYB3/W

Monday 4 June 2007 9.00 am to 10.00 am

For this paper you must have:

- a ruler with millimetre measurements.
You may use a calculator.

For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
5			
6			
7			
8			
Total (Column 1) →			
Total (Column 2) →			
Quality of Written Communication			
TOTAL			
Examiner's Initials			

Time allowed: 1 hour

Instructions

- Use blue or black ink or 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. Answers written in margins will not be marked.
- If you need extra space use pages 14 and 15 for your answers.
- Do all rough work in this book. Cross through any work you do not want to be marked.

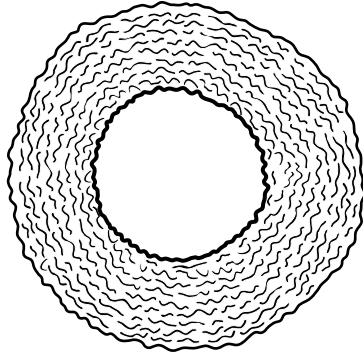
Information

- The maximum mark for this paper is 54.
- The marks for questions are shown in brackets. One mark will be awarded for Quality of Written Communication.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in your answers.
- Answers for **Questions 1 to 7** are expected to be short and precise.
- Answer **Question 8** in continuous prose. Quality of Written Communication will be assessed in the answer.

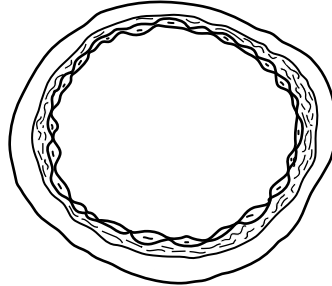


Answer **all** questions in the spaces provided.

1 (a) The diagrams show sections across an artery and a vein.



X



Y

Which diagram shows an artery? Give **one** reason for your answer.

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(1 mark)

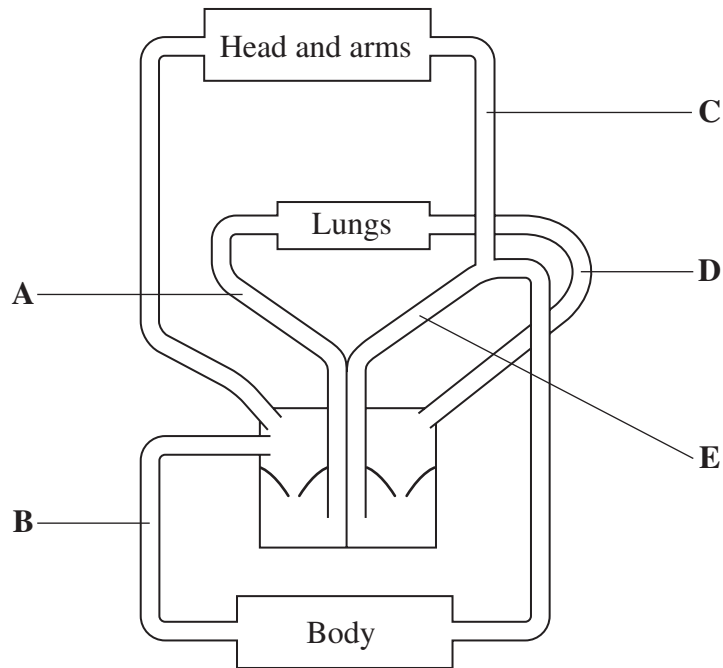
(b) The structure of a vein allows blood to flow in one direction. Explain how.

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(2 marks)



(c) The diagram shows the circulatory system of a mammal.



Complete the boxes to show which of the blood vessels **A** to **E**,

(i) contains the carotid bodies

(ii) has the lowest concentration of oxygen

(iii) carries blood at the highest pressure?

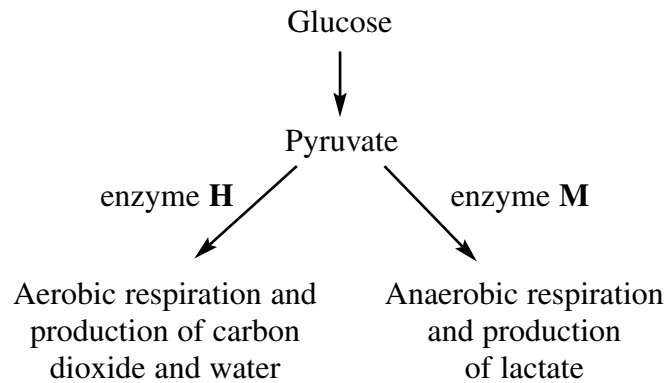
(3 marks)

6

Turn over ►



- 2 The diagram shows how glucose is broken down during respiration. Glucose is broken down into pyruvate. Two enzymes then act on the pyruvate.



The table shows the concentration of these two enzymes in the muscles of a sheep and a seal. The seal can stay underwater for a long time without breathing.

Mammal	Concentration of enzyme H / arbitrary units	Concentration of enzyme M / arbitrary units
Sheep	88	12
Seal	33	67

- (a) Explain how the relative concentration of these two enzymes is an adaptation for diving in the seal.

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(3 marks)

- (b) The glucose shown in the diagram is formed from an energy-storing polysaccharide which is found in muscles. Name this energy-storing carbohydrate.

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(1 mark)



3 (a) Tissue fluid returns to the blood in the capillaries. Describe how.

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(3 marks)

(b) In some diseases, lymph vessels in the legs may become blocked. Explain how this leads to swelling of the tissues in the feet and ankles.

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(2 marks)

5

Turn over for the next question

Turn over ►



- 4 (a) In an investigation, students measured the rate of water loss by shoots of five different species of plant. They recorded the total leaf area of each shoot. The table shows the results.

Species	Volume of water lost per minute/ mm^3	Total leaf area/ cm^2
P	50	75
Q	10	50
R	25	50
S	5	40
T	40	30

- (i) Give **one** environmental factor that should be kept constant in this investigation. Explain how allowing this factor to vary would affect the results.

Factor

Explanation

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(2 marks)

- (ii) Which species has the highest rate of transpiration per cm^2 of leaf surface? Give evidence from the table to support your answer.

Species

Evidence

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(2 marks)



(iii) Suggest which species is most likely to be found growing in hot, dry conditions. Give a reason for your answer.

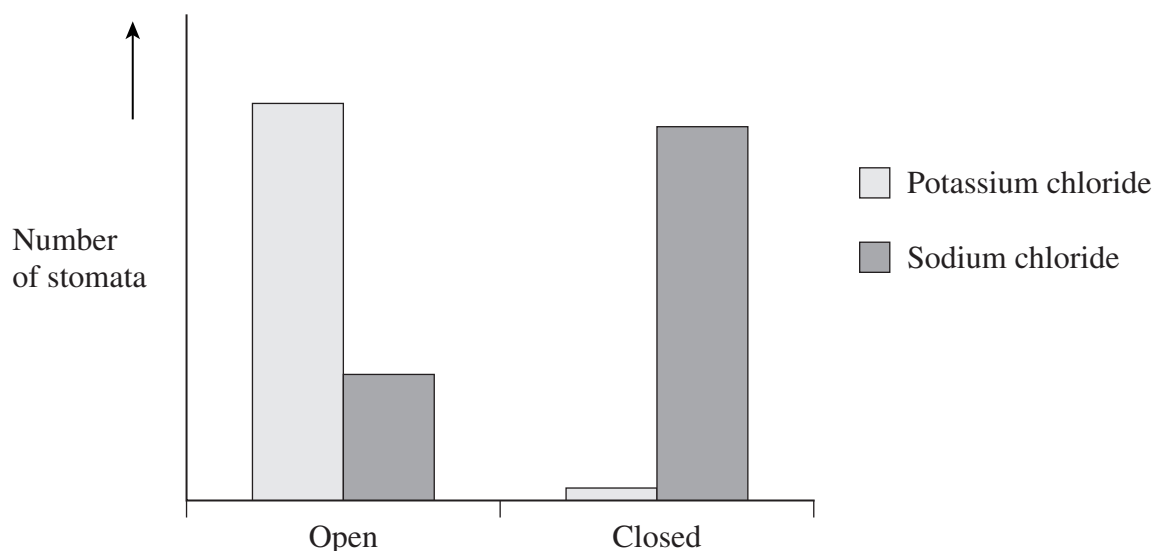
Species

Reason

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(2 marks)

(b) Stomata open because the guard cells swell when they take up water by osmosis. Scientists investigated the opening and closing of stomata. They placed samples of leaf epidermis in solutions of either potassium chloride or sodium chloride and left them for one hour. The solutions were both of the same concentration. They recorded the number of open and closed stomata in each sample. The bar chart shows the results.



Sodium chloride and potassium chloride had different effects on the opening and closing of stomata. Suggest an explanation for this.

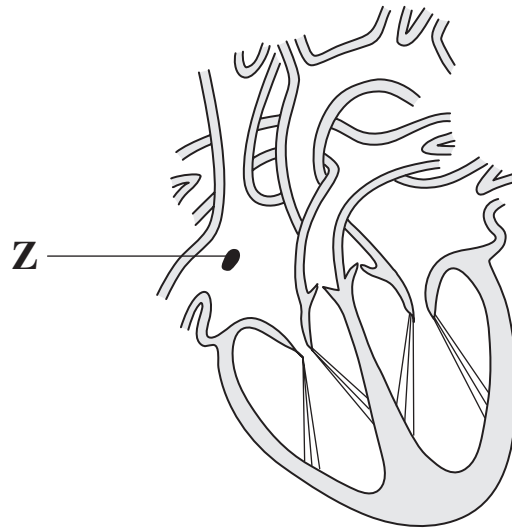
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(3 marks)

Turn over ►



5 (a) The diagram shows a section through a mammalian heart as seen from the front.



(i) Name structure **Z** found in the wall of the atrium.

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(1 mark)

(ii) Describe the role of structure **Z** in controlling the heartbeat.

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(2 marks)

(b) Letters **F** to **N** below refer to events which occur during a cardiac cycle. Put the letters into the boxes to show the correct sequence. The first one has been done for you.

- F** Semi-lunar valves open
- G** Blood enters the atria
- J** Ventricles contract
- K** Atrioventricular valves open
- L** Blood flows into the ventricles
- N** Atria contract

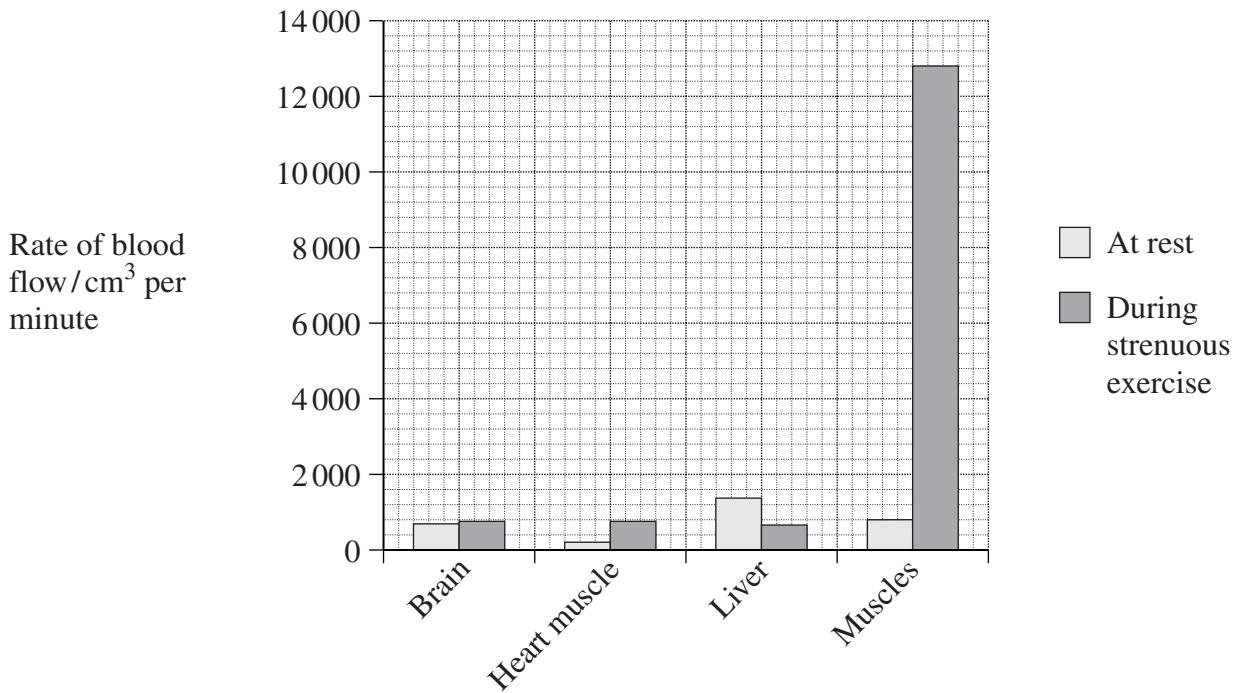
G

(1 mark)

4



6 The rate of blood flow to different parts of the body changes during exercise. The bar chart shows the blood flow to different organs and tissues, at rest and during strenuous exercise.



(a) The blood flow to the muscles increases when a person goes from rest to strenuous exercise. By how many times does it increase? Show your working.

Answer
(2 marks)

(b) Explain the advantage of the changes in blood flow during strenuous exercise.

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(4 marks)

Turn over ►



7 (a) Name the tissue in the stem of a plant involved in

(i) the transport of organic substances

(ii) the transport of water and mineral ions.

(2 marks)

(b) (i) Use your knowledge of the mass flow hypothesis to explain how sucrose is moved in a plant.

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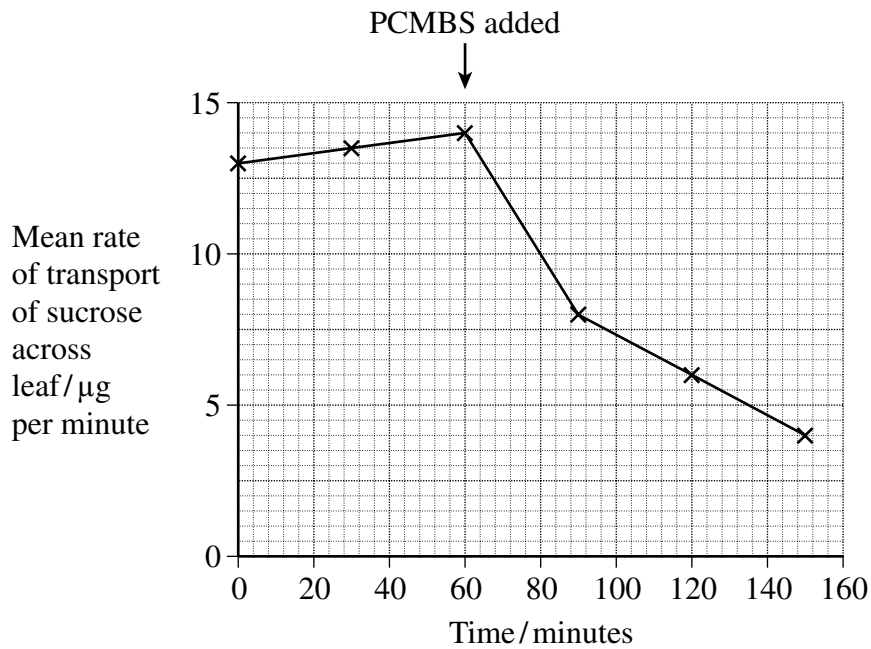
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(4 marks)



- (ii) PCMBS is a substance which inhibits the transport of sucrose. PCMBS cannot cross cell membranes to enter the cytoplasm of plant cells, so it cannot enter the symplast.

In an investigation into the pathway involved in the transport of sucrose across the leaf, PCMBS was sprayed onto the leaves of plants. The graph shows the results.



What does the graph suggest about the pathway used in the transport of sucrose across the leaf? Explain your answer.

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(2 marks)

8

Turn over for the next question

Turn over ►



Answer **Question 8** in continuous prose.
Quality of Written Communication will be assessed in these answers.

8 (a) Explain how oxygen is loaded, transported and unloaded in the blood.

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(6 marks)



(b) Explain how changes in blood pH and blood pressure during exercise bring about an increase in the rate of blood flow.

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(5 marks)

11

END OF QUESTIONS

QWC

1

Turn over ▶



Use pages 14 and 15 if you need extra answer space

A large area of dotted lines for writing answers, consisting of 23 horizontal rows.



Blank writing area with horizontal dotted lines.

Turn over ▶



1 5

There are no questions printed on this page

