

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Education
 January 2007
 Advanced Subsidiary Examination



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

BYB3/W

Wednesday 10 January 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			
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.
- Answer the questions in the spaces provided.
- 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 is 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 6** are expected to be short and precise.
- Answer **Question 7** in continuous prose. Quality of Written Communication will be assessed in the answer.

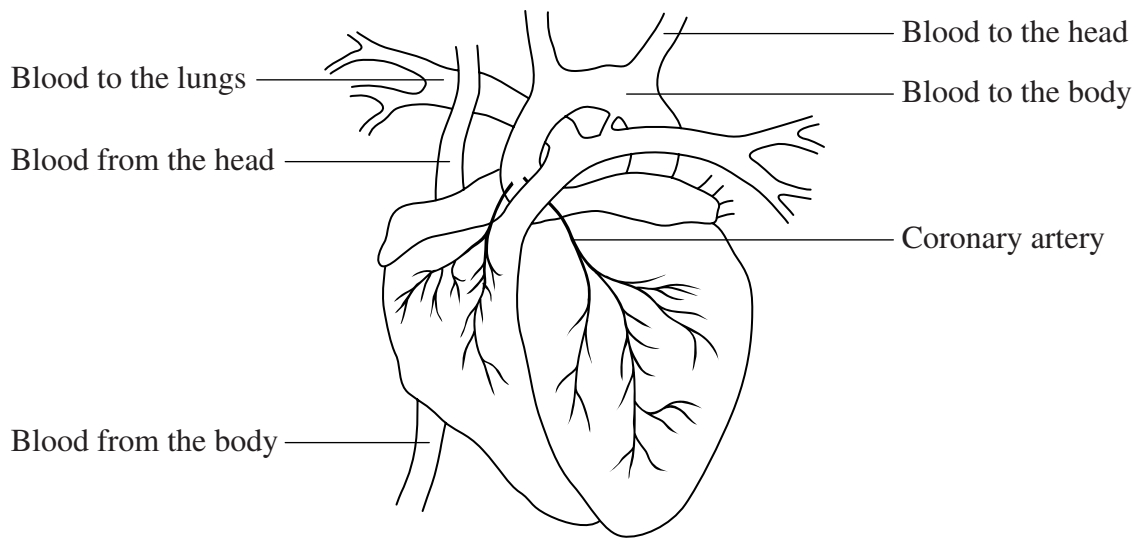
Answer **all** questions in the spaces provided.

- 1 (a) Complete the table to give **two** differences between the structure of arteries and the structure of veins.

Difference	Artery	Vein
1		
2		

(2 marks)

(b) The drawing shows an external view of a mammalian heart.



(i) Suggest a function of the coronary artery.

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 (1 mark)

(ii) From which blood vessel does the coronary artery originate?

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 (1 mark)

(c) The table shows some of the events during the cardiac cycle. Complete the table with ticks to show whether each event occurs when the ventricles are filling or when they are emptying.

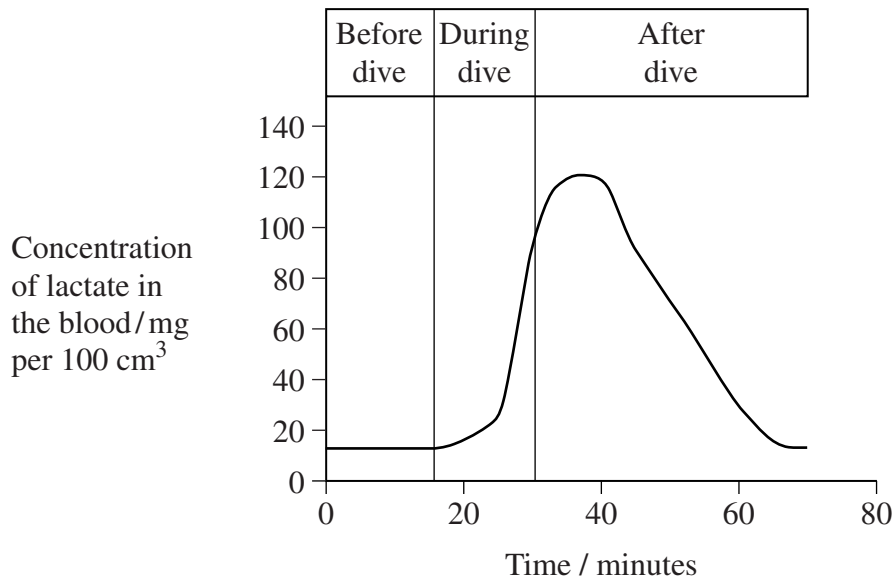
Event	Ventricles filling	Ventricles emptying
Ventricles relaxed		
Atrioventricular valves open		
Semilunar valves open		
Blood flows into the pulmonary artery		

(2 marks)

2 (a) Name the process which produces lactate in muscles.

.....
(1 mark)

(b) Seals are aquatic mammals that dive to catch food. During a dive, lactate is produced in their muscles. In an investigation, the concentration of lactate in the blood of a seal was measured during a dive and when the seal was breathing before and after a dive. The results are shown in the graph.



Describe and explain these results.

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(4 marks)

5

3 The medulla in the brain and the stretch receptors in the lungs maintain a constant rate of breathing in a resting mammal. Describe how.

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(6 marks)

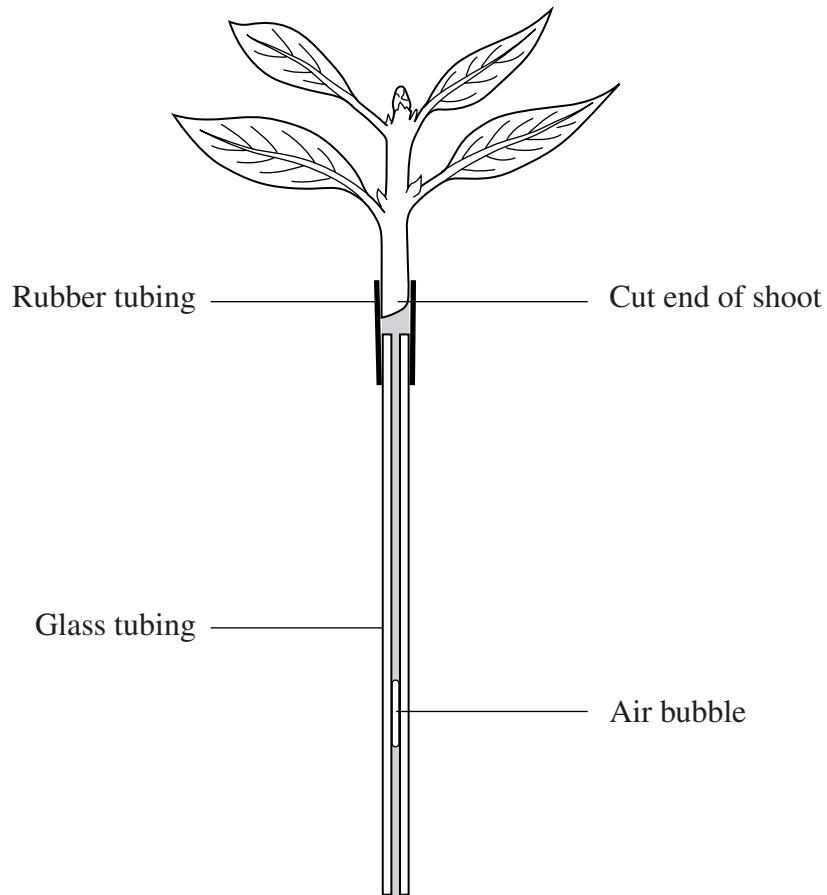
6

Turn over for the next question

Turn over ►

4 **Figure 1** shows apparatus used to measure the rate of water uptake by a leafy shoot.

Figure 1



- (a) Describe how this apparatus could be used to measure the rate of water uptake by a leafy shoot in cm^3 per minute.

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(3 marks)

- (b) Two shoots were kept in the same environmental conditions. Give **one** measurement that you would need to make to be able to compare water uptake by the shoots. Give a reason for your answer.

Measurement

Reason

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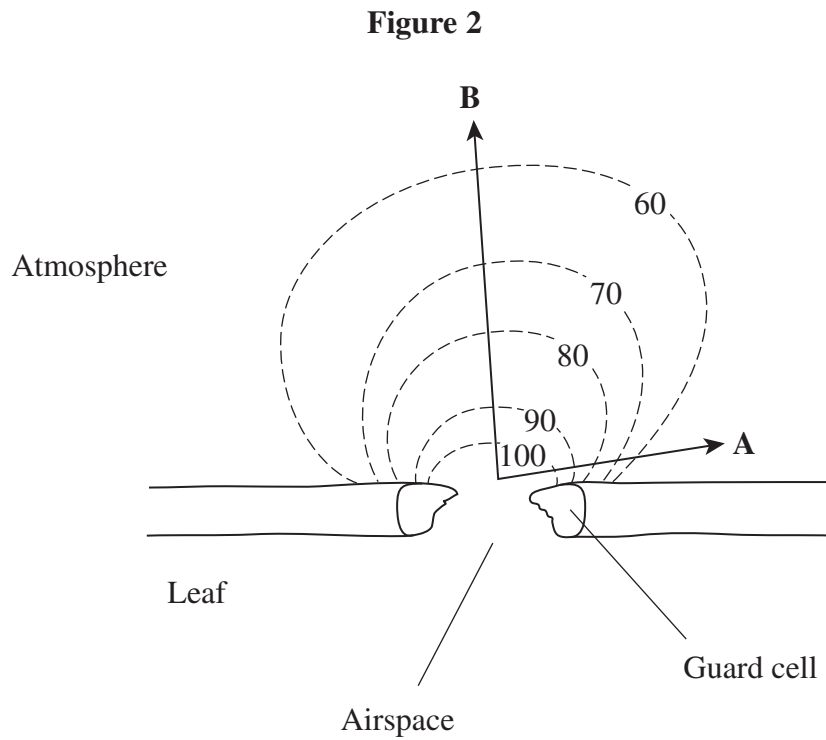
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(2 marks)

Question 4 continues on the next page

Turn over ►

- (c) **Figure 2** shows a stoma. The dotted lines show the percentage saturation of air with water vapour.



- (i) Explain the evidence from the diagram that the rate of diffusion of water vapour is greater in the direction of arrow **A** than arrow **B**.

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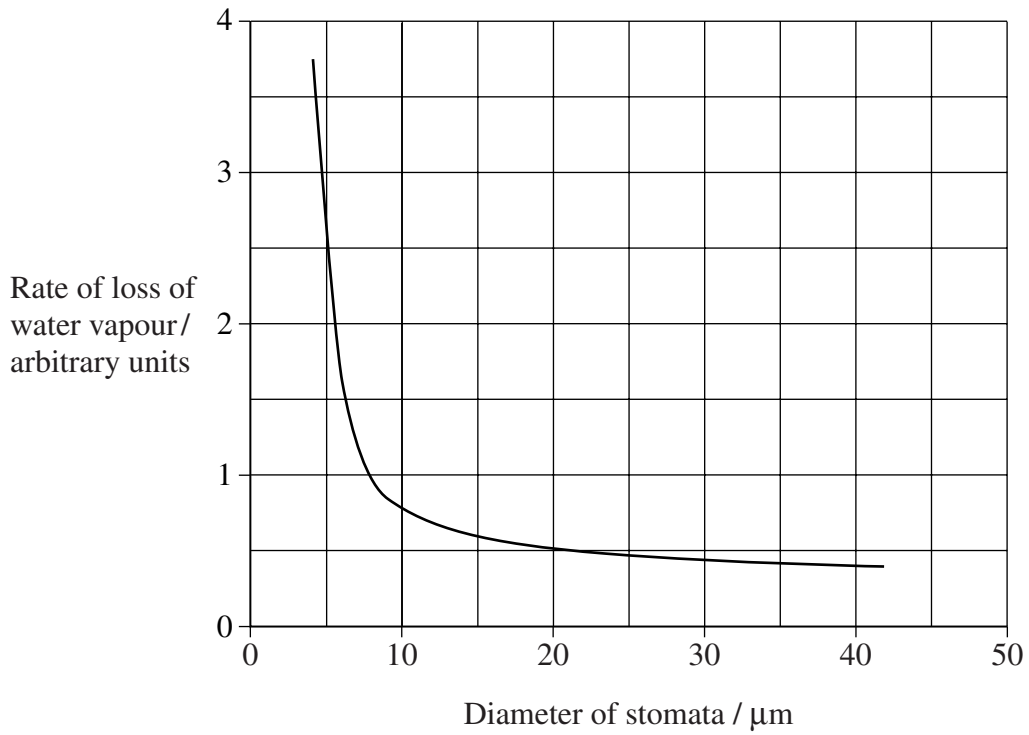
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(2 marks)

(ii) The effect of stomatal diameter on the rate of loss of water vapour was investigated. The graph shows the results.



Describe and explain the relationship shown in the graph.

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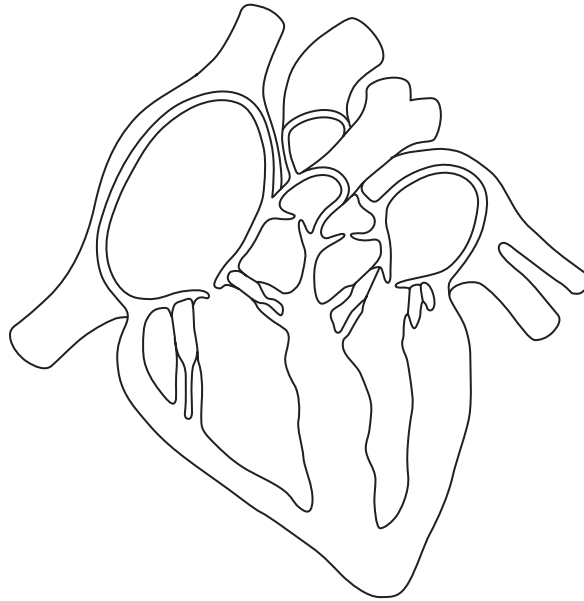
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(3 marks)

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



- (a) Write the letter **S** on the diagram to show the position of the sinoatrial node. (1 mark)
- (b) (i) Write the letter **C** on the diagram to show where ventricular contraction begins. (1 mark)
- (ii) Explain the importance of the ventricles beginning to contract where you have indicated.

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(2 marks)

(c) Describe how the heart rate is increased during exercise.

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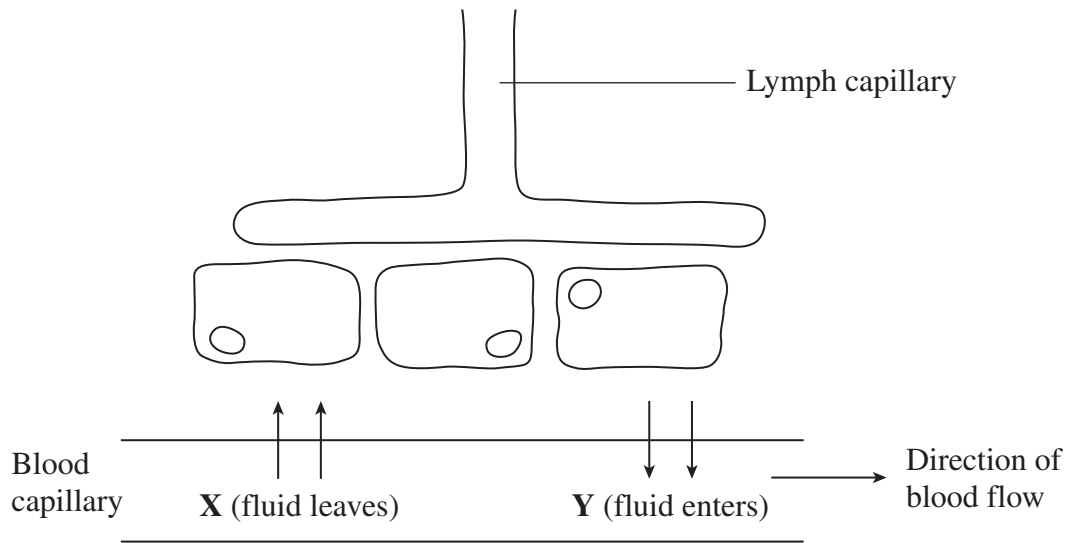
(4 marks)

8

Turn over for the next question

Turn over ►

6 (a) The diagram shows a site of exchange of substances in a tissue.



(i) What causes fluid to leave the blood capillary at point X?

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 (1 mark)

(ii) Fluid returns to the blood capillary at point Y. Explain how.

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 (1 mark)

(iii) The lymph capillary empties into a larger lymph vessel which has valves. Explain how these valves assist the return of lymph to the blood plasma.

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 (2 marks)

- (b) The table shows the number of red blood cells in the blood of mammals that spent their life at sea level or at high altitude. At sea level, the partial pressure of oxygen is 21 kPa and at 4500 m above sea level it is 11 kPa.

Species	Mean number of red blood cells per $\text{mm}^3 \times 10^6$	
	Sea level	High altitude (4500 m)
Human	5.0	7.4
Sheep	10.5	12.1
Rabbit	4.6	7.0
Llama	11.4	12.3

- (i) Explain the advantage of the increased number of red cells in mammals living at high altitude.

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(2 marks)

- (ii) Suggest which **two** of the species in the table live naturally at high altitude. Use the data to explain your answer.

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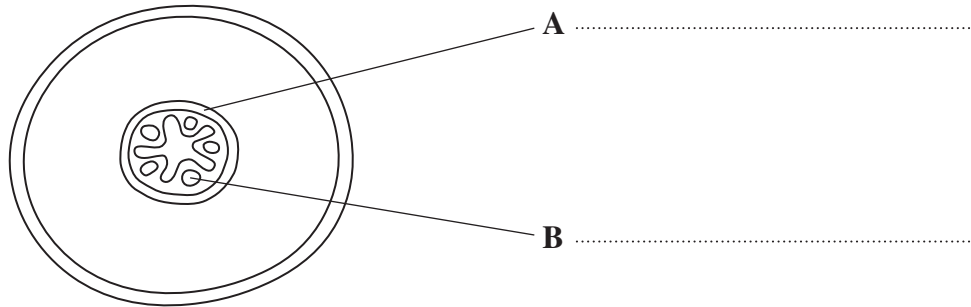
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(2 marks)

Answers to **Question 7** should be written in continuous prose.
Quality of Written Communication will be assessed in this answer.

7 (a) The diagram shows some tissues in a root. Name the parts labelled **A** and **B**.



(2 marks)

(b) Describe how water is taken up by root hairs and reaches the xylem in the root.

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(6 marks)

- (c) Marram grass has specialised cells within its leaves that enable the leaf to roll in on itself. In conditions of water shortage the leaf rolls with the lower surface inwards. This adaptation enables marram grass to withstand very dry conditions. Explain how.

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(2 marks)

10

END OF QUESTIONS

QWC

1

There are no questions printed on this page