

Surname						Other Names					
Centre Number						Candidate Number					
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General Certificate of Education  
January 2005  
Advanced Subsidiary Examination



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

**BYB3/W**

Monday 10 January 2005 Morning Session

**In addition to this paper you will require:**

- a ruler with millimetre measurements.

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
QWC			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: 1 hour

**Instructions**

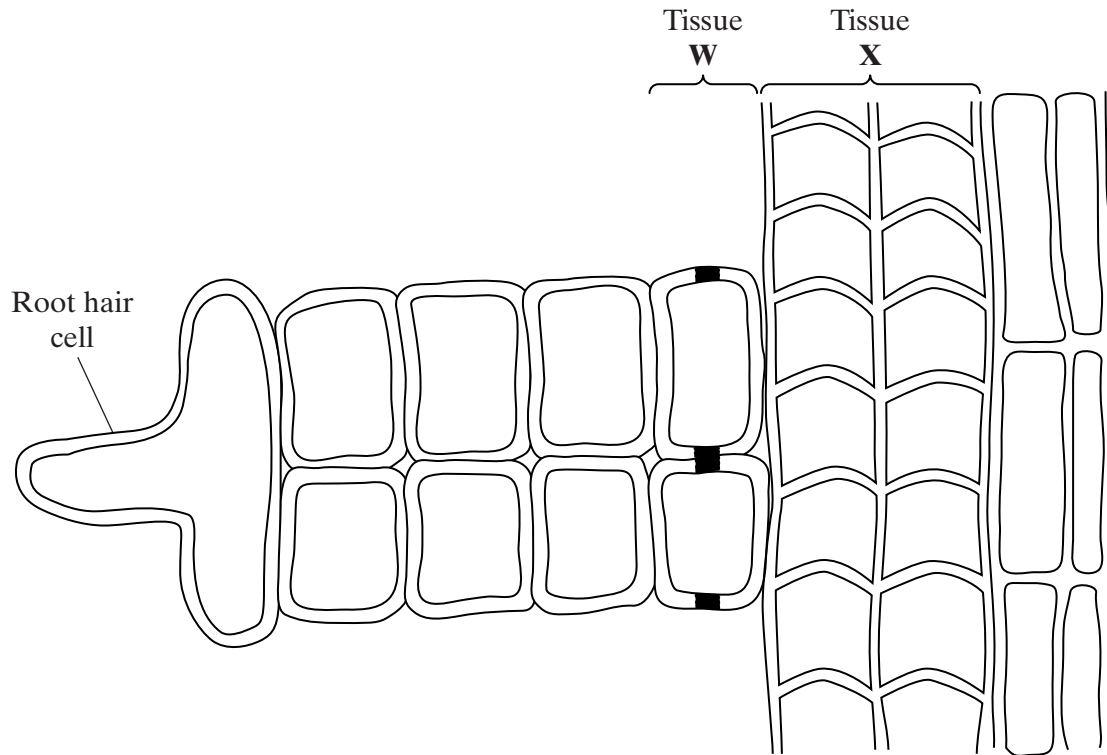
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**

- The maximum mark for this paper is 54.
- Mark allocations are shown in brackets.
- Answers for **Questions 1 to 6** are expected to be short and precise.
- Question 7** should be answered in continuous prose. Quality of Written Communication will be assessed in the answer. You will be awarded up to 1 mark for your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate. The legibility of your handwriting and the accuracy of your spelling, punctuation and grammar will also be taken into account.

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

- 1** The diagram shows some cells from the tissues in a root.



- (a) Name the tissues labelled **W** and **X**.

**W** .....

**X** .....

(2 marks)

- (b) Explain why water moves from the apoplast pathway to the symplast pathway when it reaches the tissue labelled **W**.

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(2 marks)

- (c) ATP is used at a high rate in the phloem tissue of roots. Explain what ATP is used for in phloem tissue.

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(2 marks)

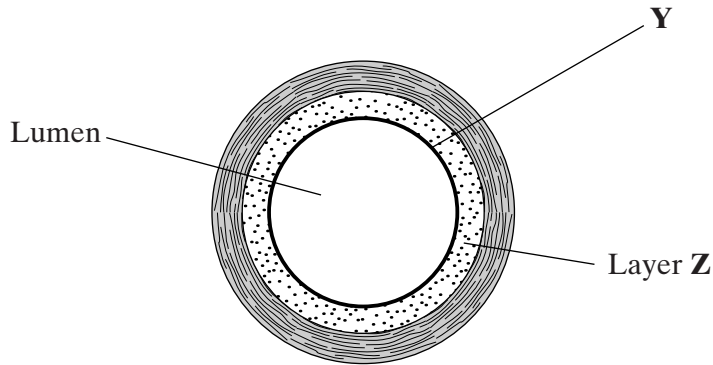


**TURN OVER FOR THE NEXT QUESTION**

**Turn over**

**NO QUESTIONS APPEAR ON THIS PAGE**

2 The diagram shows a cross-section of an artery.



Magnification  $\times 10$

(a) Name the layer labelled **Y**.

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(1 mark)

(b) Layer **Z** contains a high proportion of elastic tissue.

Describe the advantage of having elastic tissue in the wall of an artery.

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(2 marks)

(c) Calculate the cross-sectional area of the lumen of the artery shown in the diagram. Show your working.

The area of a circle is given by  $\pi r^2$ , where  $r$  is the radius of a circle ( $\pi = 3.14$ ).

Answer .....  $\text{mm}^2$   
(3 marks)

6

Turn over

3 The concentration of lactate in muscle tissue increases when a person exercises.

(a) (i) Name the process that produces lactate.

.....  
(1 mark)

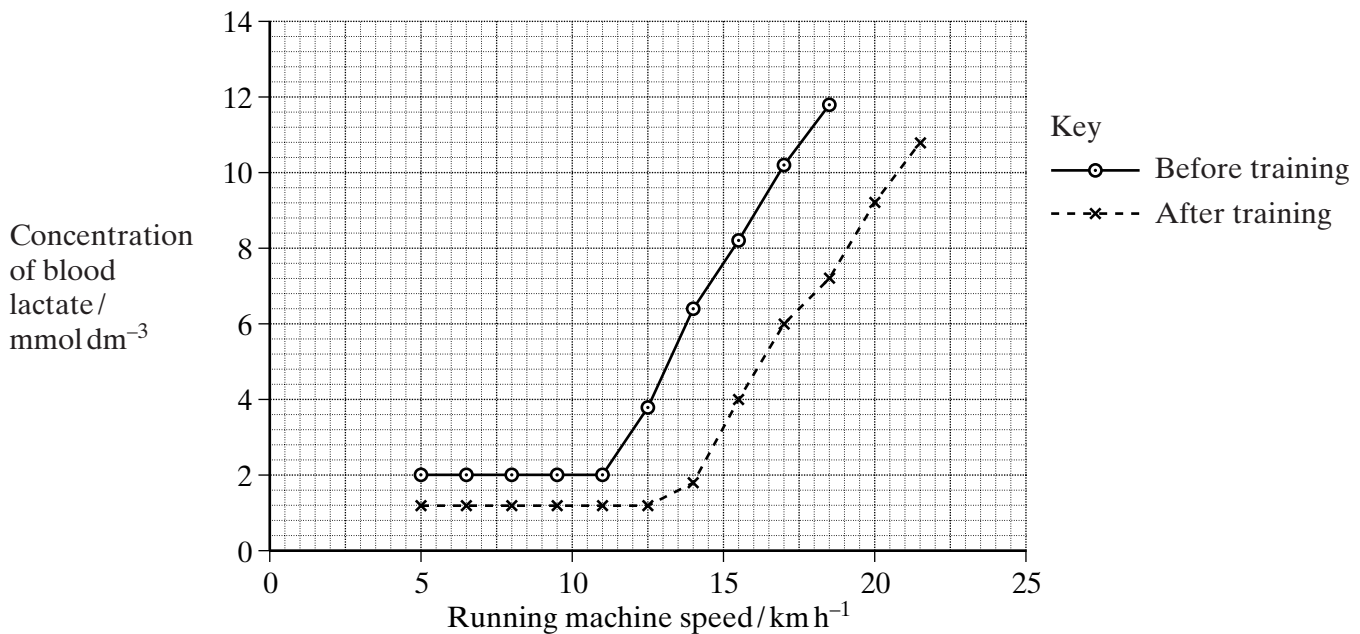
(ii) Describe what happens to the lactate in muscle tissue when exercise stops.

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(2 marks)

(b) In an investigation, a man carried out a series of tests on a running machine, with the machine set at different speeds. In each test he ran for the same time. The concentration of lactate in his blood was measured after each test.

The man repeated the same tests after a six-week period of intensive training.

The results are shown in the graph.



(i) Describe the effect of training on the concentration of blood lactate in this man.

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(2 marks)

(ii) Explain **one** reason why training resulted in a difference in the concentration of blood lactate when the running machine was set at higher speeds.

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(2 marks)

7

**TURN OVER FOR THE NEXT QUESTION**

**Turn over** ▶

4 (a) In mammals, changes in the composition of the blood may affect breathing.

(i) What change in the composition of blood stimulates an increased rate of breathing?

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*(1 mark)*

(ii) What causes this change in the composition of blood?

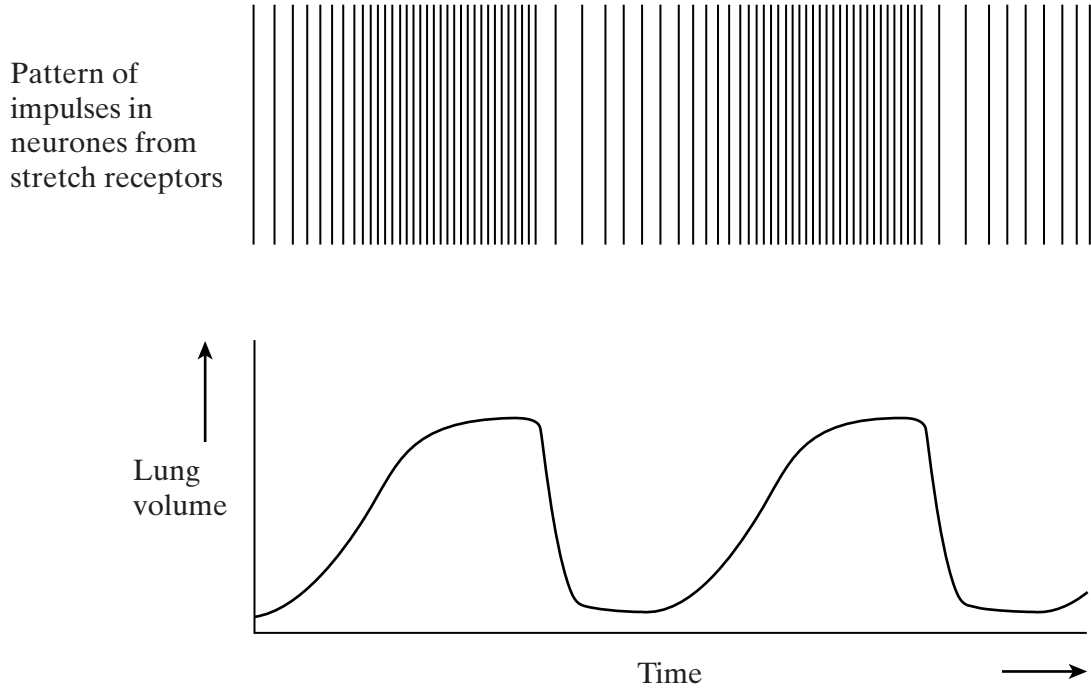
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*(1 mark)*

(b) Explain how movement of the thorax occurs following stimulation of the inspiratory centre in the brain.

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*(2 marks)*



(c) Changes in lung volume and the activity in neurones from stretch receptors in the lungs were measured during an investigation. The results are shown in the graph.



Use the information above and your knowledge of the control of breathing to describe how expiration is stimulated.

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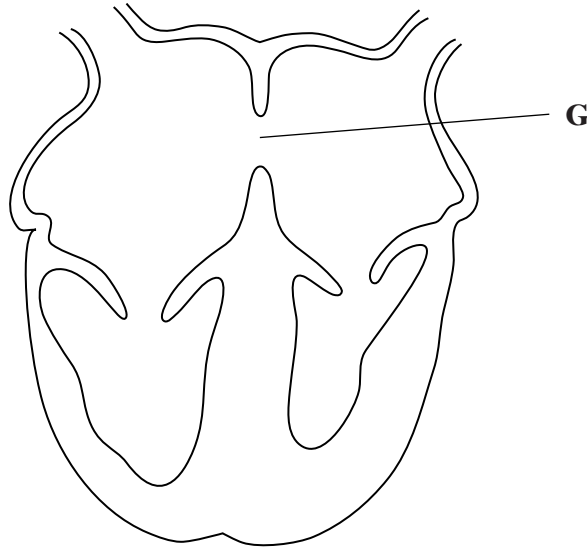
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(3 marks)

7

Turn over

5 The diagram shows the structure of the heart of a fetus.



The gap labelled **G** closes shortly after a baby is born.

(a) (i) Name the **two** heart chambers connected by the gap **G**.

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(1 mark)

(ii) Sometimes gap **G** does not close properly after a baby is born. Explain how the presence of this gap affects the composition of blood circulating through tissues in the body of the baby.

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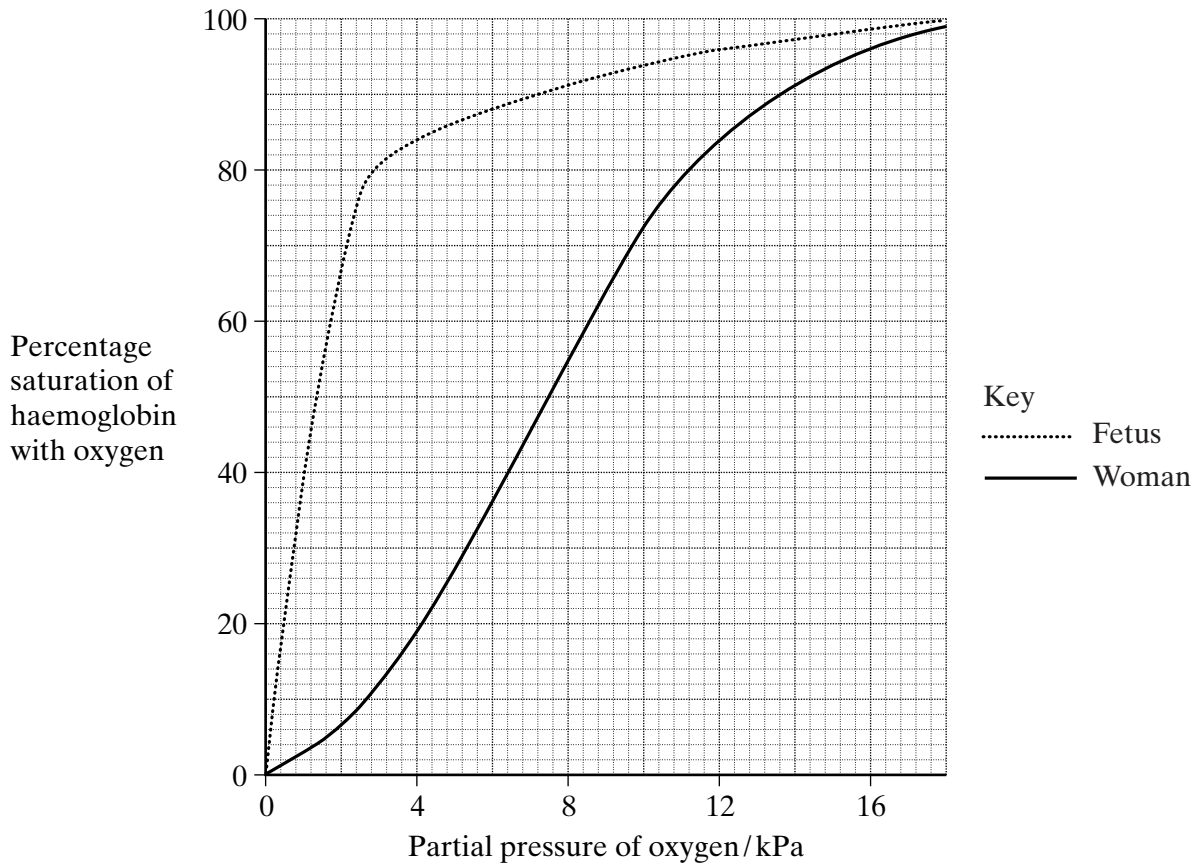
(2 marks)

(b) Gas exchange in a fetus occurs across the placenta. Explain why it is important to maintain a supply of blood to the lungs of the fetus, even when they are not being used for gas exchange.

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(1 mark)

- (c) The oxygen haemoglobin dissociation curves for a woman and her fetus are shown in the graph.



- (i) Use the graph to find the difference between the percentage saturation of haemoglobin in the blood of the woman and the fetus when the partial pressure of oxygen in the placenta is 4 kPa.

Answer .....  
(1 mark)

- (ii) Explain how efficient gas exchange is ensured by the dissociation curve for the fetus being to the left of the dissociation curve for the woman.

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(2 marks)

- 6 (a) Describe how water is moved through a plant according to the *cohesion-tension* hypothesis.

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(4 marks)

- (b) The mass of water lost from a plant was investigated. The same plant was used in every treatment and the plant was subjected to identical environmental conditions. In some treatments, the leaves were coated with a type of grease. This grease provides a waterproof barrier. The results of the investigation are given in the table.

Treatment	Mass lost in 5 days/g
No grease applied	10.0
Grease applied only to the upper surface of every leaf	8.7
Grease applied to both surfaces of every leaf	0.1

(i) What is the advantage of using the same plant in every treatment?

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.....  
*(1 mark)*

(ii) Why was it important to keep the environmental conditions constant?

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.....  
*(1 mark)*

(iii) What is the evidence that the grease provides a waterproof barrier?

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*(1 mark)*

(c) (i) Calculate the mass of water lost in 5 days through the upper surface of the leaves.

Answer .....  
*(1 mark)*

(ii) Use your knowledge of leaf structure to explain why less water is lost through the upper surface of leaves than is lost through the lower surface.

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*(2 marks)*

10

Turn over ►

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

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- 7 (a) A woman takes moderate exercise. Explain what causes her heart rate to increase while she exercises.

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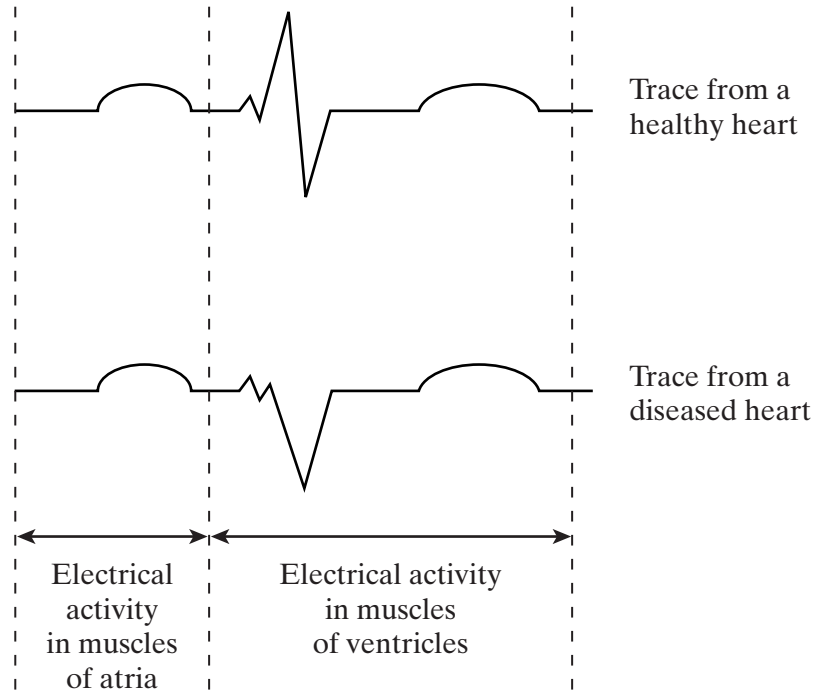
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*(6 marks)*

- (b) An electrocardiogram (ECG) measures the electrical changes occurring in cardiac muscle as a heart is beating. An ECG trace for a healthy person and an ECG trace for a person suffering from heart disease are shown.



- (i) Describe the route taken when electrical impulses are transmitted from the sinoatrial node to the muscles of the ventricles in a healthy heart.

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(2 marks)

- (ii) Explain how information from these ECG traces suggests that the damage caused to the diseased heart is unlikely to have affected the sinoatrial node.

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(2 marks)

**END OF QUESTIONS**

**QWC**

**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**