

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced Subsidiary GCE**

**BIOLOGY**

**2803/01**

Transport

Monday

**2 JUNE 2003**

Morning

45 minutes

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Candidate Name	Centre Number	Candidate Number										
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> </tr> </table>						<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> <td style="width: 15px; height: 15px;"></td> </tr> </table>					

**TIME** 45 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 on the question paper.
- Read each question carefully before starting your answer.

**INFORMATION FOR CANDIDATES**

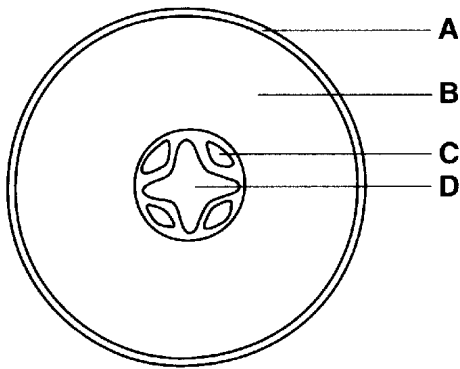
- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the stages in any calculations.

<b>FOR EXAMINER'S USE</b>		
Qu.	Max.	Mark
1	10	
2	10	
3	5	
4	14	
5	6	
<b>TOTAL</b>	<b>45</b>	

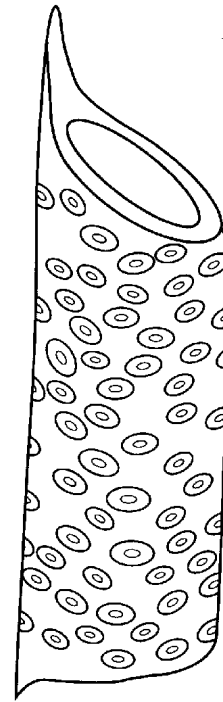
**This question paper consists of 8 printed pages.**

Answer **all** the questions.

- 1 (a) Fig. 1.1 shows a transverse section of a plant organ and Fig. 1.2 shows a xylem vessel element from one of the tissues **A–D** shown in this organ.



**Fig. 1.1**



**Fig. 1.2**

- (i) Name the organ shown in Fig. 1.1.

.....[1]

- (ii) State in which of the tissues, **A–D**, xylem vessel elements are found.

.....[1]

- (iii) Describe how xylem vessel elements are adapted for their function.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....[3]

(b) The water potential of the soil in a field where wheat was growing successfully was measured and found to be  $-40$  kPa.

(i) State which of the following water potential values is most likely to be found in the cell sap of the root hairs of these plants.

- $-40$  kPa.
- $-60$  kPa.
- $-20$  kPa.
- $-10$  kPa.

Answer .....kPa [1]

(ii) What effect would flooding with seawater have on the water potential of the soil?

.....[1]

(iii) Explain what would happen to the wheat plants in the soil as a result of this change in water potential.

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

2 (a) During the cardiac cycle the pressure in the different chambers of the heart varies in a regular pattern.

State in which one of the four chambers of the heart

(i) the highest pressure is generated;

.....[1]

(ii) the greatest change in pressure occurs.

.....[1]

(b) Fig. 2.1 shows the changes in blood pressure during one cardiac cycle.

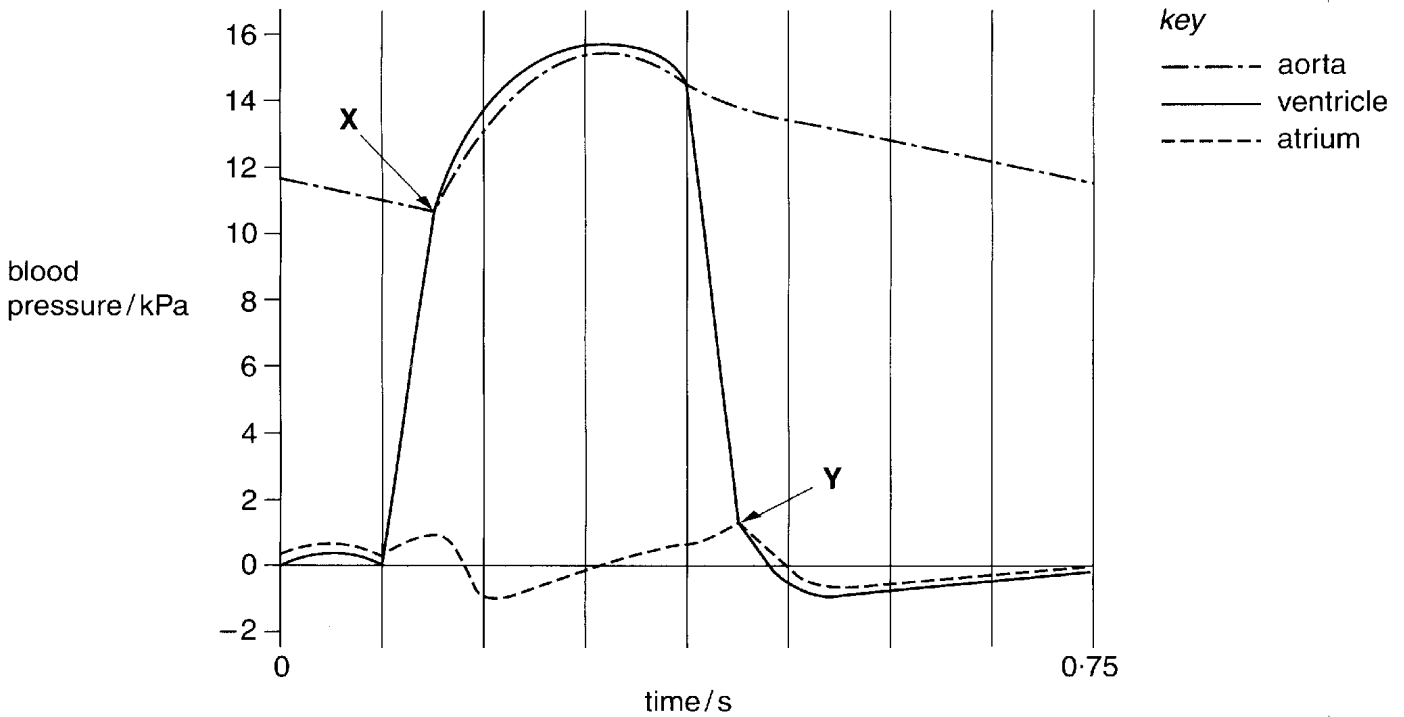


Fig. 2.1

(i) Use the information in Fig. 2.1 to calculate the heart rate in beats per minute. Show your working.

.....  
 .....  
 .....

Answer ..... beats per minute [2]



4 (a) Fig. 4.1 is a photomicrograph of a human blood smear.

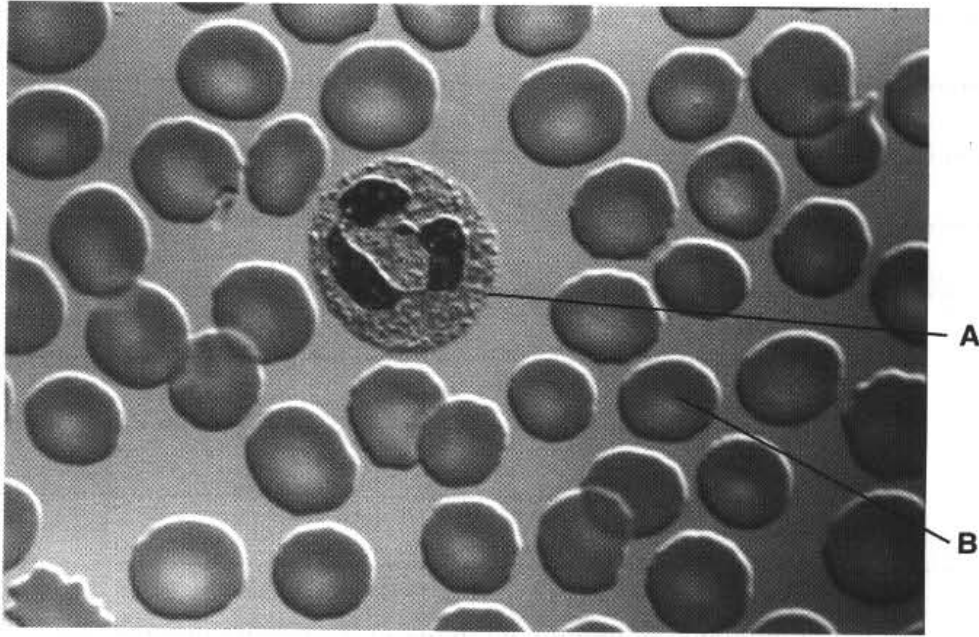


Fig. 4.1

(i) Cell type **A** is a white blood cell. Name this type of white blood cell, giving a reason for your identification.

name .....

reason .....

.....[2]

(ii) State what will happen to the numbers of cell type **B** if a person spends a long time at high altitude.

.....[1]

(iii) Explain the significance of this change in numbers of cell type **B**.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]



5 Fig. 5.1 shows the structures involved in gaseous exchange in mammals.

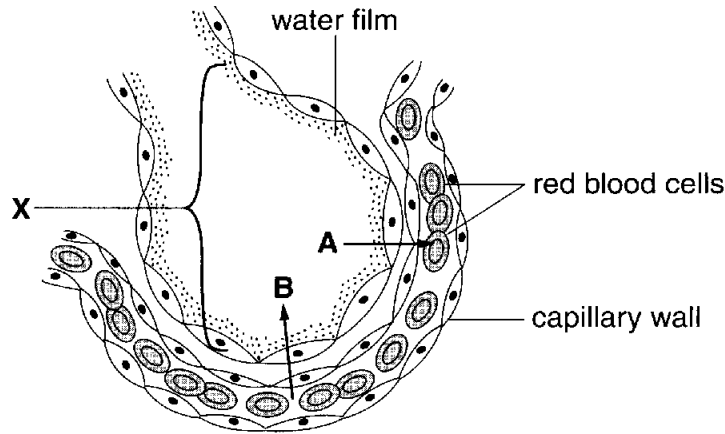


Fig. 5.1

(a) (i) Name the structure **X**. .....[1]

(ii) Name the process by which gases cross the gas exchange surface.  
.....[1]

(iii) **A** and **B**, on Fig. 5.1, show the directions taken by gases crossing the gas exchange surface.

Name the gases moving in directions **A** and **B**.

direction **A** .....

direction **B** .....[1]

(b) Structure **X**, shown in Fig. 5.1, is very delicate. The surface tension of the water film shown in the diagram would cause **X** to collapse if it were not for a substance in the film that lowers the surface tension. This substance is secreted in the fetal lungs late in pregnancy. Premature babies sometimes display breathing difficulties, a condition known as Respiratory Distress Syndrome. Without treatment, premature babies may become exhausted.

Suggest the cause of this condition and suggest why premature babies may become exhausted.

.....  
 .....  
 .....  
 .....  
 .....  
 .....[3]

[Total: 6]

Copyright Acknowledgements:

Question 1 Fig. 1.1 and 1.2 from 'Advanced level study aids: Biology', p. 154 and p. 157, by J. Churchman and K. Pedder, published by John Murray.  
 Question 4 Fig. 4.1 © Science Photo Library.

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**2803/01 Transport**

**June 2003**

**Mark Scheme**

## ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.  
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks ( $\frac{1}{2}$ ) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.
  - x = incorrect response (errors may also be underlined)
  - ^ = omission mark
  - bod = benefit of the doubt (where professional judgement has been used)
  - ecf = error carried forward (in consequential marking)
  - con = contradiction (in cases where candidates contradict themselves in the same response)
  - sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

<b>Mark Scheme</b> Page 3 of 8	<b>Unit Code</b> <b>2803/01</b>	<b>Session</b> June	<b>Year</b> 2003	<b>Version</b> Final
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<b>Abbreviations, annotations and conventions used in the Mark Scheme</b>	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit R = reject ( ) = words which are not essential to gain credit <u>      </u> = (underlining) key words which <b>must</b> be used to gain credit ecf = error carried forward AW = alternative wording A = accept ora = or reverse argument
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Question	Expected Answers	Marks
1 (a) (i)	root;	1
(ii)	D;	1
(iii)	<i>note that structure must link to function</i> lack of cell contents / cytoplasm / AW e.g. hollow, for, reduced resistance / ease of flow / AW; <b>R</b> dead unless well qualified <b>R</b> smooth continuous tube / lack of end walls / AW, for, reduced resistance / ease of flow / AW; wide / large lumen ( <b>A</b> correct diameters – 0.01 – 0.2 mm), for reduced resistance / flow / AW; wide to carry plenty of water / AW; lignin to stop (inward) collapse; lignin makes it, waterproof / impermeable; lignified / thick, walls, to provide support; <b>R</b> strength lignin allows adhesion; pits to allow lateral movement; <b>A</b> pores for pits (differentiates) as a continuous column to allow cohesion / AW;	max 3
(b) (i)	-60;	1
(ii)	lower it / make it more negative / AW;	1
(iii)	<i>water potential now lower outside the plant</i> water lost (from roots) / less water uptake; by osmosis; (in correct context) down / reduced, water potential gradient; <b>R</b> concentration gradient water stress / become flaccid / wilting / drooping / loss of turgor / stomata close; <b>R</b> limp / soft / shrink / shrivel / dehydrate (possible) plasmolysis / description; (may) die / grow less well / reduced growth / less yield / AW;	max 3

[Total: 10]

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
2 (a) (i)	<u>left</u> ventricle;	1
	(ii) <u>left</u> ventricle;	1
(b) (i)	80;; (60 divided by 0.75)	2
	(ii) credit one use of pressure figures with units in <b>X</b> or <b>Y</b> ;  <b>at X</b>  ventricle is, contracting / in systole; ventricle pressure, equals / exceeds, aortic pressure; lowest aortic pressure / pressure in aorta starts to rise; <b>R</b> is rising semilunar / aortic / pocket valves, open; <b>A</b> blood passing through named valve blood enters aorta (from ventricle); <b>A</b> blood leaves ventricle  <i>for last two points A '...about to...' statements</i>	<b>max 3</b>
	<b>at Y</b>  ventricle, is relaxing / in diastole; ventricular pressure, equals / falls below, atrial pressure / ora; atrium at highest pressure; atrioventricular / AV / mitral / bicuspid, valve opens; <b>A</b> blood passing through named valve <b>R</b> tricuspid / cuspid blood, enters ventricle / leaves atrium;  <i>for last two points A '...about to...' statements</i>	<b>max 3</b>
		<b>[Total: 10]</b>

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
<b>3</b>	xerophytes / xerophytic; <b>A</b> phonetic attempts but <b>R</b> –cytes etc transpiration / evaporation / evapotranspiration; surface (area) to volume; wax / cutin / waxy cuticle / cuticle; <b>A</b> accept hairs / trichomes <b>R</b> cilia day / AW; <b>A</b> hottest period / AW <b>R</b> 'most of the time'	<b>5</b>

**[Total: 5]**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
4 (a) (i)	phagocyte / polymorph / neutrophil / granulocyte / eosinophil; R basophil / lymphocyte / leucocyte / WBC / monocyte / agranulocyte / macrophage	1
	<i>reason</i> lobed / AW, nucleus; R multinucleate, elongated larger than red blood cell; granular cytoplasm;	max 1
(ii)	increase / AW;	1
(iii)	1 means more haemoglobin; 2 (so) more oxygen can be picked up / transported / AW; R efficient, unequal / refs to speed A idea of 'getting same amount, as before' / at lower altitude low 3 pO <sub>2</sub> / oxygen in short supply, at altitude / AW; 4 idea that it compensates for the low oxygen saturation of haemoglobin at altitude; 5 (thus) muscle / tissue / organs / cells, supplied / delivered with (sufficient) oxygen; R body unqualified 6 to allow <u>aerobic</u> respiration; 7 to provide energy / ATP / ref to metabolism / AW; R 'more active' 8 to reduce the chance of, oxygen debt / oxygen deficit / lactate accumulation / suffering from altitude sickness / AW; A symptoms of altitude sickness, but <b>not</b> tired / breathless / feel ill	max 4

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(b) *reject Hb for haemoglobin on the first occasion where it is used*

- C1** carried by haemoglobin / forms oxyhaemoglobin;
- C2** haem group / Fe, has affinity / AW, for oxygen;
- C3** 4 O<sub>2</sub> / 8 O, per haemoglobin;
- C4** idea that association varies in ease / AW;
- C5** (producing) sigmoid / S shaped, (dissociation) curve; **A** from a diagram
- C6** low pO<sub>2</sub> in tissues / AW; **R** body unqualified
- C7** (leads to) dissociation / unloading / AW, of O<sub>2</sub> from haemoglobin;
- C8** idea that steep part of curve corresponds with max release of O<sub>2</sub> / AW;

to max 5

- B1** Bohr effect is the effect of carbon dioxide on the curve / AW;
- B2** moves (dissociation) curve to the right; **A** from diagram
- B3** (so) more oxygen unloaded / reduces Hb affinity for oxygen;
- B4** carbon dioxide forms carbonic acid / H<sub>2</sub>CO<sub>3</sub>;
- B5** ref role of carbonic anhydrase;
- B6** carbonic acid dissociates / AW, to produce H<sup>+</sup> / lowers pH;
- B7** H<sup>+</sup> replaces O<sub>2</sub> on oxyhaemoglobin / AW;
- B8** correct ref to haemoglobinic acid; **A** HHb

to max 5

**max 6**

**QWC - clear, well organised using specialist terms**

**1**

**[Total : 14]**

<b>Mark Scheme</b> Page 8 of 8	<b>Unit Code</b> <b>2803/01</b>	<b>Session</b> June	<b>Year</b> 2003	<b>Version</b> Final
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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
5 (a) (i)	alveolus; <b>A</b> alveoli / alveolar (air) sac / alveolar space <b>R</b> air sac / alveolar wall	1
(ii)	diffusion;	1
(iii)	<b>A</b> = oxygen <b>B</b> = carbon dioxide;	1
(b)	lack of, substance / surfactant / lipoproteins / AW (to lower surface tension); (so) alveoli are collapsed / less surface area / AW; <b>R</b> 'fewer working' <b>ecf if (a) (i) is air sac / bronchiole etc</b> less oxygen (in the correct context); <b>R</b> no oxygen insufficient, energy / ATP / respiration (for breathing movements); ref lactic acid build up (in intercostals / diaphragm muscles); AVP; e.g. try to breathe more rapidly problem with inflation of alveoli gene for substance not functioning <b>R</b> genetic disease / gene missing etc	max 3
<b>[Total: 6]</b>		