

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**Advanced Subsidiary GCE**

**BIOLOGY**

**2803/01**

Transport

Wednesday

**15 JANUARY 2003**

Afternoon

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: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>						<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></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>		
<b>Qu.</b>	<b>Max.</b>	<b>Mark</b>
<b>1</b>	<b>6</b>	
<b>2</b>	<b>16</b>	
<b>3</b>	<b>9</b>	
<b>4</b>	<b>5</b>	
<b>5</b>	<b>9</b>	
<b>TOTAL</b>	<b>45</b>	

**This question paper consists of 11 printed pages and 1 blank page.**

Answer **all** the questions.

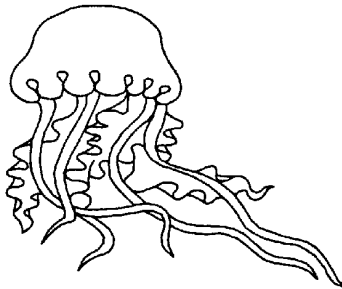
1 Fig. 1.1 shows three examples of organisms and provides some information on their size and the number of cell layers present.

amoeba



- single celled
- 0.5 mm diameter

jelly-fish



- 2 layers of cells
- each layer 1 cell thick
- up to 10 cm diameter

field mouse



- 3 layers of cells in embryo
- each layer many cells thick in the adult
- length approximately 10 cm

**Fig. 1.1**

(a) (i) Which of the organisms shown in Fig. 1.1 will need the most highly developed transport system?

..... [1]

(ii) State **two** reasons for your answer.

1 .....

.....

2 .....

..... [2]

(b) List **three** substances that would need to be transported in the organism you have chosen in (a) (i).

1 .....

2 .....

3 ..... [3]

[Total: 6]

2 Fig. 2.1 is a vertical section through part of the leaf of a dicotyledon.

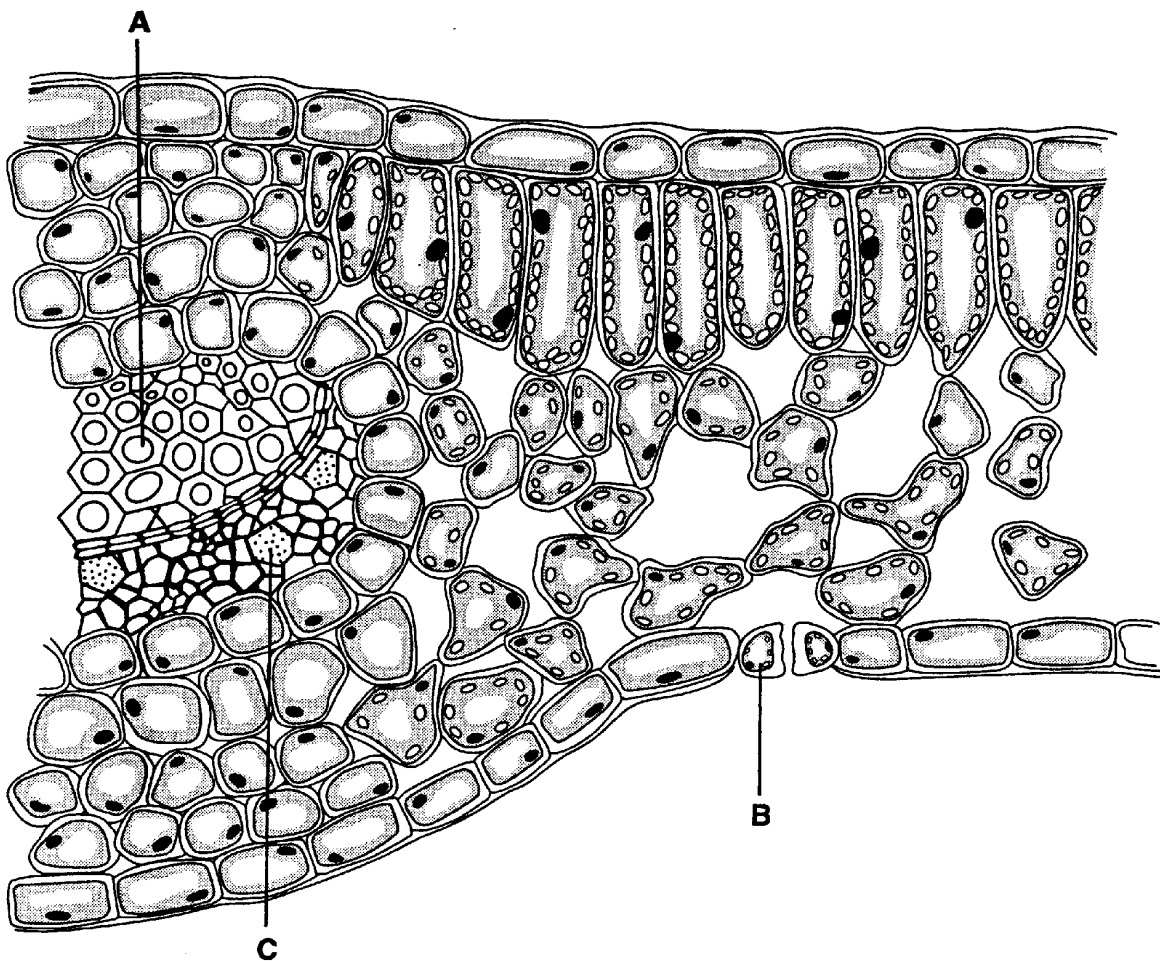


Fig. 2.1

(a) Identify A, B, and C.

- A .....
- B .....
- C ..... [3]

(b) Plants typically lose large quantities of water each day by transpiration.

Explain why the loss of large quantities of water by transpiration is inevitable.

- .....
- .....
- .....
- .....
- .....
- ..... [2]

(c) Fig. 2.2 shows the rate of transpiration of the **same plant** on two consecutive mornings, day 1 and day 2.

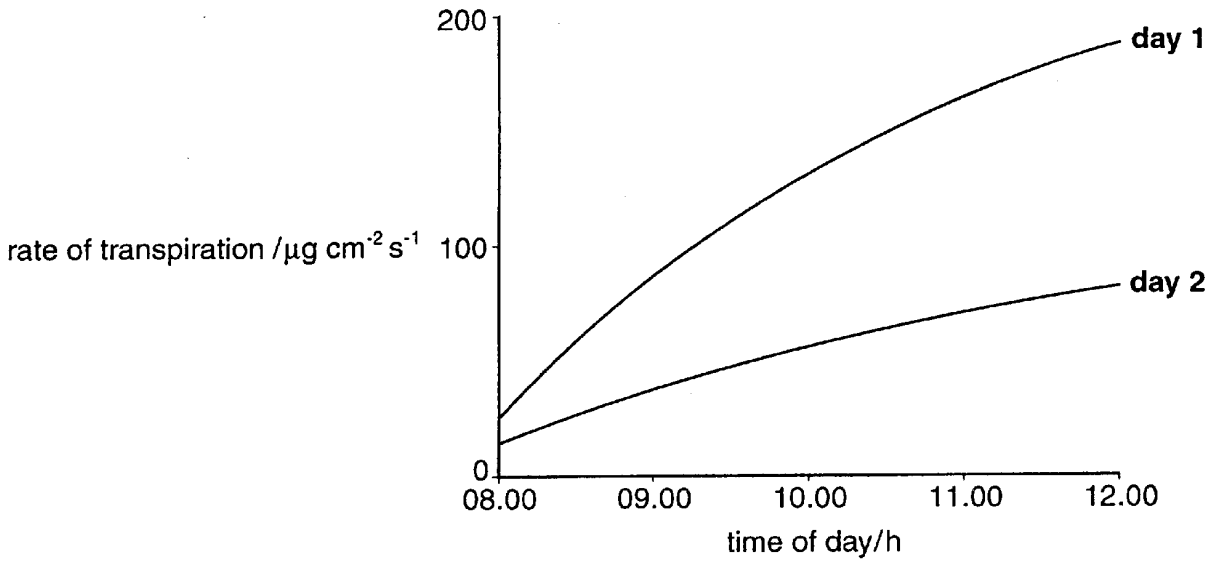


Fig. 2.2

(i) Suggest **two** environmental factors that could account for the difference between day 1 and day 2 and explain how they could have caused the difference.

factor 1 .....

explanation .....

.....

factor 2 .....

explanation .....

..... [4]



- 3 (a) Fig. 3.1 is a simplified plan of the mammalian circulatory system. The system is described as a double circulation.

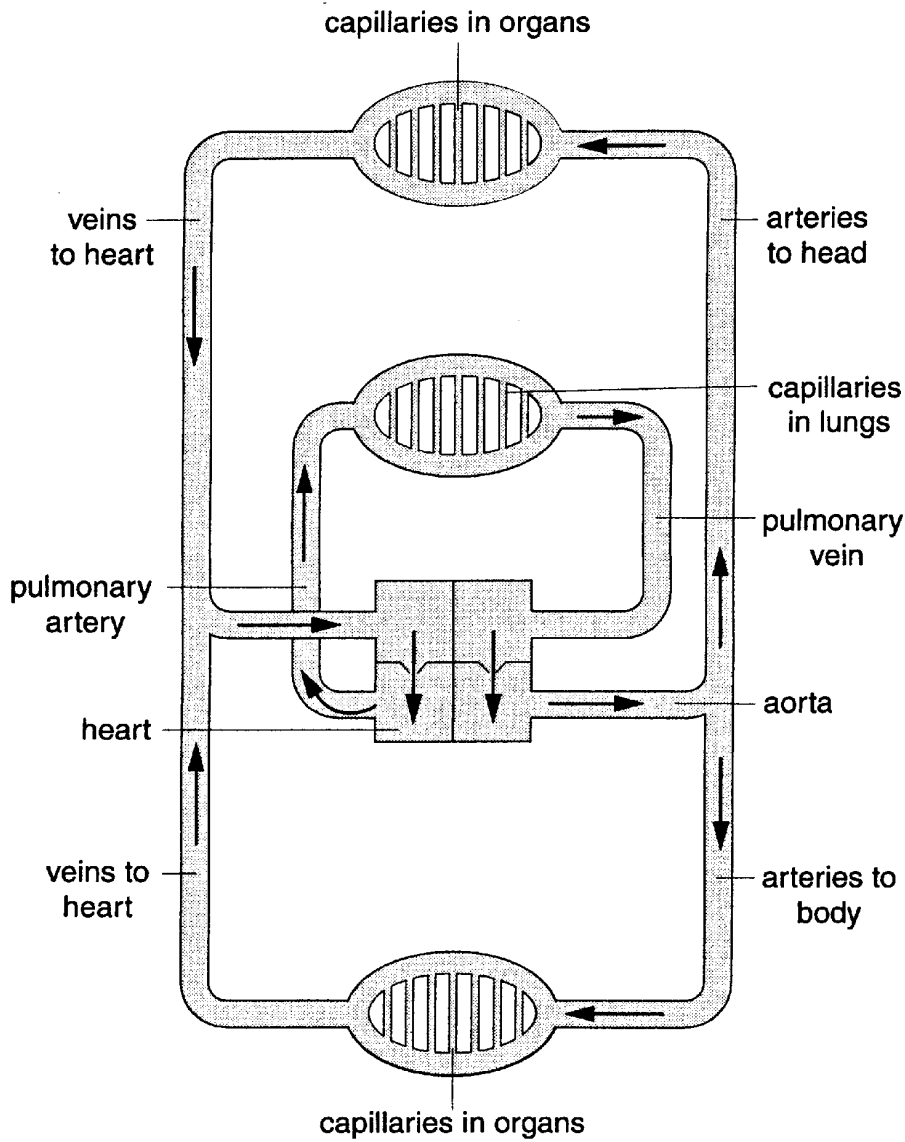


Fig. 3.1

- (i) Use the information in Fig. 3.1 to state what is meant by the term *double circulation*.

.....  
 .....  
 ..... [2]

- (ii) Suggest an advantage of the double circulation shown in Fig. 3.1.

.....  
 .....  
 ..... [1]

(b) Fig. 3.2 shows some detail of the external and internal structure of the mammalian heart and associated blood vessels.

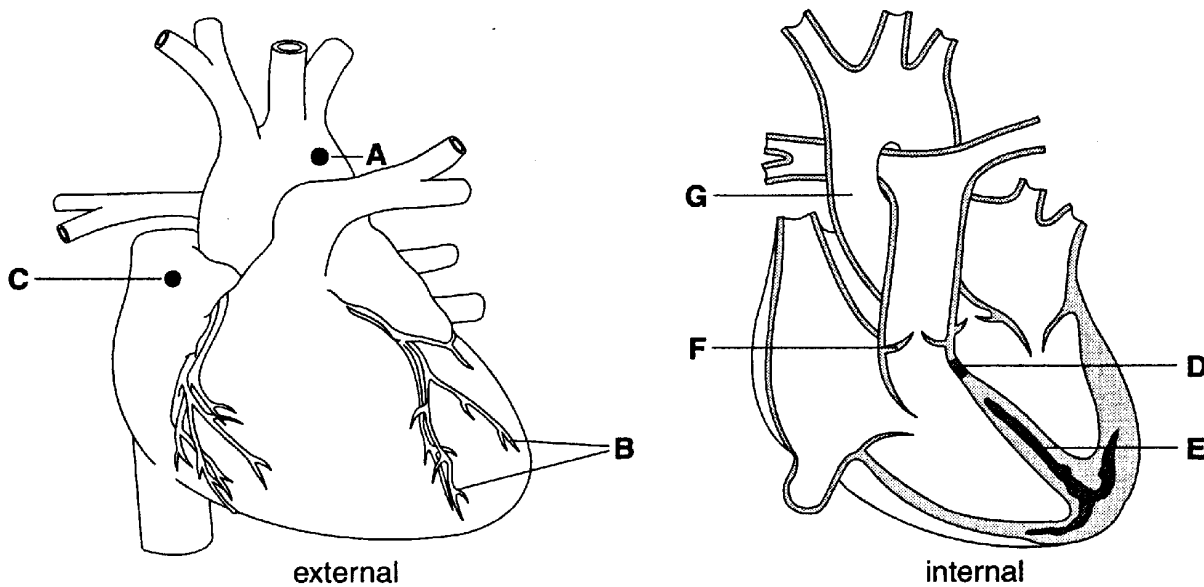


Fig. 3.2

Table 3.1 lists some possible functions of parts of the heart.

Table 3.1

possible function	letter
contracts to force blood into the ventricle	P
stops impulses crossing the septum between the atria and the ventricles	Q
acts as a pacemaker	R
carries blood away from the heart to the body	S
conducts impulses to the apex of the heart	T
relays the impulses to the septum between the ventricles	U

Complete the table below by

- identifying each of the features listed, using an appropriate letter from Fig. 3.2
- matching a function to the feature, using the appropriate letter from Table 3.1.

The first one has been done for you.

feature	letter on Fig. 3.2	letter in Table 3.1
aorta	G	S
sino-atrial node		
atrio-ventricular node		
Purkyne (Purkinje) fibres		

[6]

[Total: 9]

[Turn over

- 4 The paragraph below gives information about phloem transport in plants.

Fill in the blanks in the paragraph with the most appropriate word or words.

Phloem consists of two important types of cell concerned with transport, namely sieve tube elements and ..... cells . Sieve tube elements are connected to each other by modified cell walls known as .....

These elements transport assimilates , mainly ..... , from areas known as sources to areas known as ..... . ATP is needed for this process, which suggests that the mechanism is .....

[5]

[Total: 5]



5 (a) Fig. 5.1 shows two blood vessels, X and Y, in transverse section.

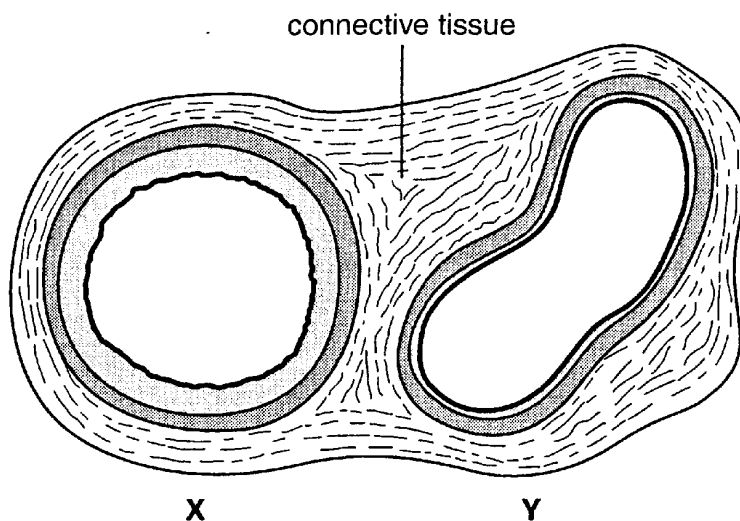


Fig. 5.1

(i) State which of the blood vessels, X or Y, is a vein.

..... [1]

(ii) Give **two** reasons for your choice.

1 .....

.....

2 .....

..... [2]

(b) Fig. 5.2 gives information about blood pressure in various parts of the mammalian blood system.

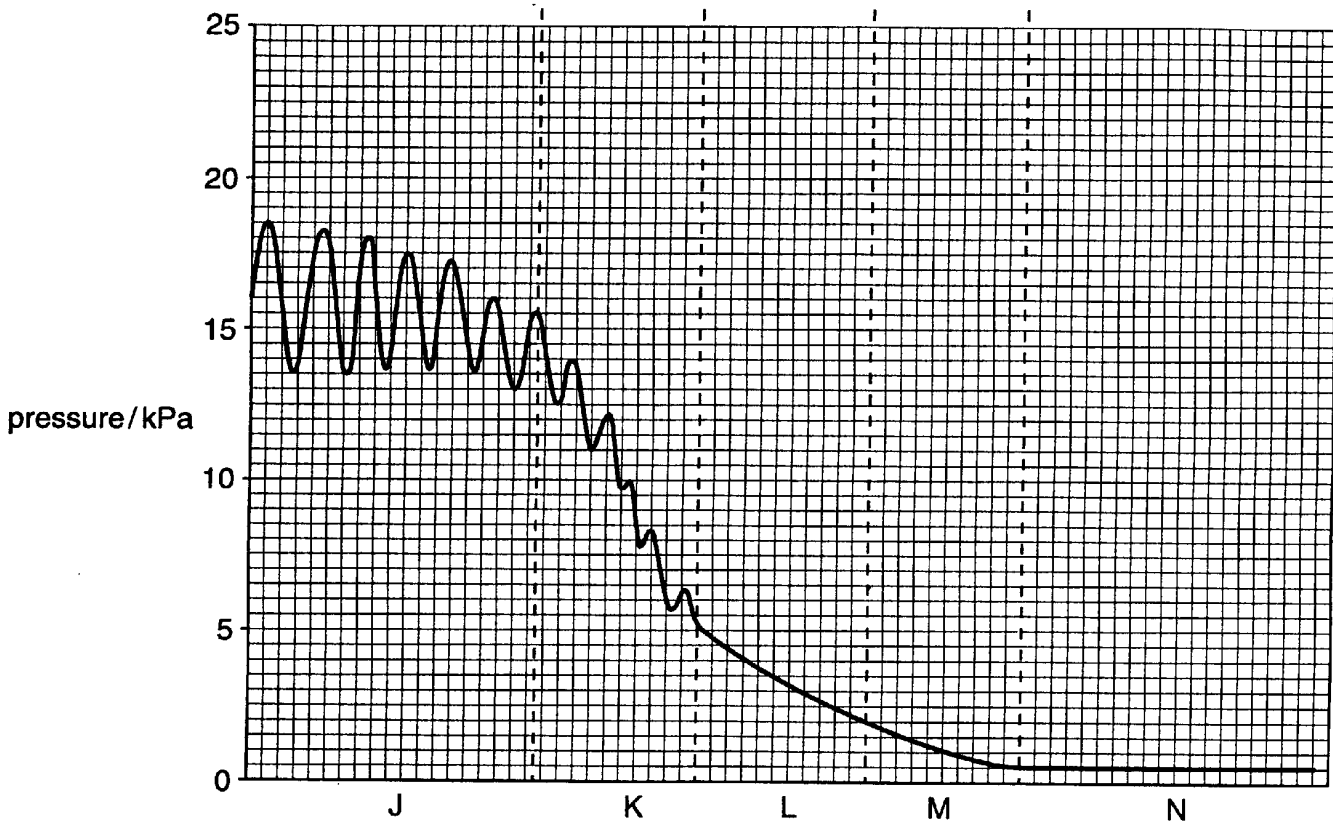


Fig. 5.2

(i) Calculate the drop in systolic pressure in section J of Fig. 5.2. Show your working.

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

Answer ..... kPa [2]

(ii) State which section, J to N, of Fig. 5.2 shows the pressure in the veins.

..... [1]

(c) Explain briefly how blood in the veins is returned to the heart.

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



RECOGNISING ACHIEVEMENT

JANUARY 2003

ADVANCED SUBSIDIARY GCE UNIT

## MARK SCHEME

---

**MAXIMUM MARK: 45**

**Syllabus / Component: 2803/01**

**Biology: Transport**

---

Paper Set Date: 15/01/03

## 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>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
	( )	= words which are not essential to gain credit
	_____	= (underlining) key words which <b>must</b> be used to gain credit
	ecf	= error carried forward
	AW	= alternative wording
	A	= accept
R	= reject	
ora	= or reverse argument	

Question	Expected Answers	Marks
1 (a) (i)	(field) mouse;	1
(ii)	many cell (layers); <b>A</b> 3 cell layers cells deep in the body / diffusion too slow / AW; (more metabolically) active / AW; surface area to volume (ratio) low / lowest (of the three) <i>ora</i> large vol:SA;  <i>apply ora if answered in terms of other organisms</i> <b>R</b> size unqualified	2 max
(b)	oxygen; <b>A</b> oxygenated blood carbon dioxide; urea / creatinine; <b>R</b> urine hormones / named hormone; vitamins / named vitamin; ions / minerals / named ion / named mineral / salts; sugars / monosaccharides / named monosaccharide; <b>R</b> carbohydrates / sucrose fatty acids / glycerol / lipids / monoglycerides; amino acids / antibodies / proteins / named protein; <b>R</b> if dietary protein implied lactate / lactic acid; water;  <i>accept 3 named hormones/vitamins / minerals etc.</i> <i>accept 'respiratory gases' for 1 mark</i>	3 max

[Total: 6]

Question	Expected Answers	Marks
2 (a)	A = xylem / xylem, vessel(s) / tube / element / lumen of xylem (vessel); B = guard cell(s); C = phloem / sieve tube(s) / sieve plate(s) / sieve elements;	3
(b)	stomata are open (during the day); <i>must state / imply open stomata</i> to allow gas exchange / AW; <b>A</b> one named gas exchanged large (moist) surface area of (spongy) mesophyll / large leaf area; ref diffusion / (water potential) gradient;	2 max
(c) (i)	temperature; (warmer) gives more evaporation / saturation capacity of air higher / ref to (kinetic) energy / AW; humidity; diffusion gradient steeper in low humidity / AW;  air movement / wind; boundary layer / diffusion shells / AW, blown away in windier conditions;  light; ref to effect on stomatal aperture i.e. open in light;  credit ref to different temp effects (on day 1 and 2) regarding stomatal opening or closing;;  credit ref to very high wind causing stomatal closure;;  <i>apply ora as appropriate</i>  <i>one mark for factor and one for explanation in each case. Look for factor in explanation if not clear in first line and credit it there</i>	4 max

- (ii) 1 use a potometer (uptake);  
2 take a (suitable) shoot of the plant / AW;  
3 set up, under water / avoiding airlocks / cut under water / AW;  
4 all (joints) air tight / seal / AW;  
5 simulate / AW, a stated condition / day 1 / AW;  
6 further detail; e.g. a second condition  
or detail of how condition achieved  
or simulate / AW day 2  
7 allow time to acclimatise;  
8 record movement for a set time / note start to end / AW;  
9 repeat several times;  
10 calculate a mean;  
11 convert (linear measures) to mass; **A** via volumes where appropriate  
12 per given, unit time / unit area;  
13 AVP; e.g. cut stem at angle / use fully turgid material / similar size  
or type / dry leaves or remove grease

*credit information from a suitably labelled diagram*  
*credit equivalent points for another suitable method e.g. a mass*  
*potometer*

*mass potometer*

- 1 (mass) potometer;  
2 take shoot / whole plant;  
3 idea that all but plant covered to stop transpiration;  
4 other detail of set up / apparatus;  
5-13 as above - credit ref to sensitivity of balance

*'condensation method'*

- 1-4 *no marks*  
5-13 as above where possible

**6 max**

**QWC legible text with accurate spelling, punctuation and grammar**

**1**

**[Total: 16]**

Question	Expected Answers	Marks
3 (a)	separation of oxygenated and deoxygenated blood; <i>credit once in (i) or (ii)</i>	
(i)	blood flows twice through heart; per one full circulation / AW; pulmonary (circulation) / to lungs; systemic (circulation) / to the body / AW; <b>R</b> systematic	<b>2 max</b>
(ii)	more oxygen reaches tissues <i>or</i> cells / more efficient supply to tissues <i>or</i> cells; helps (sustain) high blood pressure / AW; less resistance to flow; easier to return blood to heart; more rapid circulation; greater activity possible; too high a pressure does not damage lungs;	<b>1 max</b>
(b)	C;            R; D;            U; E;            T;	<b>6</b>
		<b>[Total: 9]</b>



Question	Expected Answers	Marks
4	companion; sieve plates; sucrose; sinks; active / uses energy; R alive or metabolic unqualified	5
<b>[Total: 5]</b>		

Question	Expected Answers	Marks
5 (a) (i)	Y;	1
(ii)	thin(ner) wall; thin(ner) tunica media / middle layer / coat; less / AW, muscle / elastic tissue (in tunica media); wide® lumen / AW; ref to shape qualified; not, 'crinkly' tunica intima / inner layer; <b>A</b> suitable alternative <i>apply ora for X</i>	2 max
(b) (i)	18.5 – 15.5 = 3 (kPa);;	
	<i>award the calculation mark if both systolic pressures are correct but subtraction is wrong or if one of the systolic pressures <b>within J</b> is read incorrectly, but the subtraction is correct</i>	
	<i>if diastolic pressures used, no mark</i>	
	<i>no marks if pressures outside <b>J</b> are used</i>	2
(ii)	N; <b>R</b> ranges like M-N	1
(c)	action of, skeletal / surrounding / AW muscle; <b>R</b> muscle unqualified valves; stop backflow / AW; low pressure in thorax; AVP; e.g. action of heart / enters right or left atrium / named vein / residual pressure in vein	3 max
		[Total: 9]