OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

BIOLOGY

2803/1

Transport

Tuesday **5 JUNE 2001** Afternoon 1 hour

Candidates answer on the question paper.
Additional materials:
Electronic calculator

Candidate Name	Centre Number	Candidate Number

TIME 1 hour

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 the spaces on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 60.
- You will be awarded marks for the quality of written communication where an answer requires a piece of extended writing.
- You may use an electronic calculator.
- You are advised to show all the stages in calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	14	
2	14	
3	7	
4	15	
5	10	
TOTAL	60	

This question paper consists of 10 printed pages and 2 blank pages.

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For Examiner's Use

Answer **all** questions.

1 Figs 1.1 and 1.2 show the external and internal features respectively of the mammalian heart.

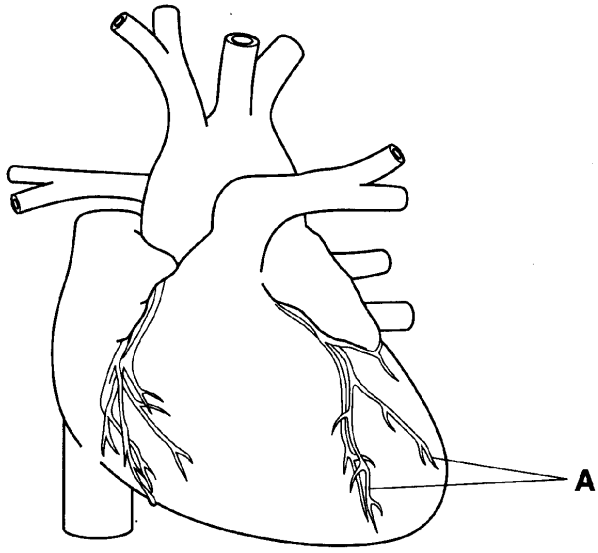

Fig. 1.1

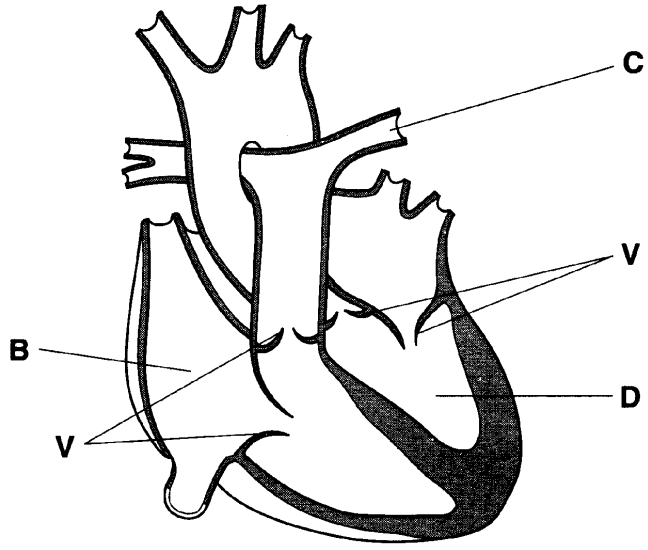

Fig. 1.2

(a) Name structures **A** to **D**.

A .....

B .....

C .....

D ..... [4]

Some people are born with heart defects, while others develop heart defects later.

(b) Suggest the likely effects on the circulatory system of the following heart defects:

(i) a baby born with a hole in the wall between the left and right chambers of the heart ('hole in the heart');

.....

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.....[2]

(ii) valves **(V)** not working properly.

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.....[2]

[Turn over

For Examiner's Use

Fig. 1.3 shows the pressure changes in various parts of the circulatory system during one cardiac cycle.

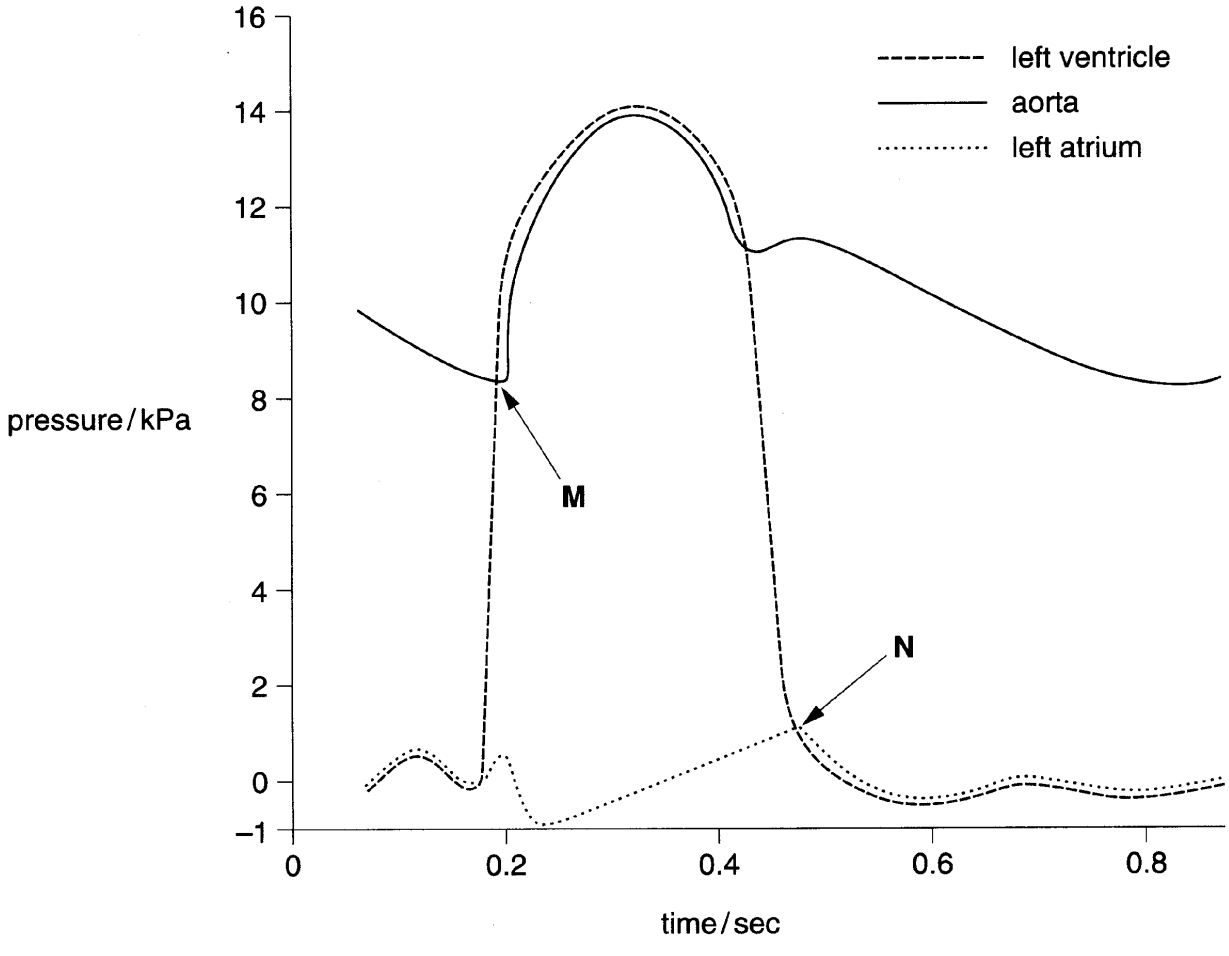

Fig. 1.3

At **M** and **N**, valves are either opening or closing.

(c) With reference to Fig. 1.3, explain what is happening at **M** and **N**.

M .....

.....

.....

N .....

.....

.....[4]

For Examiner's Use

(d) Explain why the maximum pressure in the left atrium is lower than the maximum pressure in the left ventricle.

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.....[2]

[Total : 14]

2 The cells shown in Fig. 2.1 are adapted for transport in flowering plants.

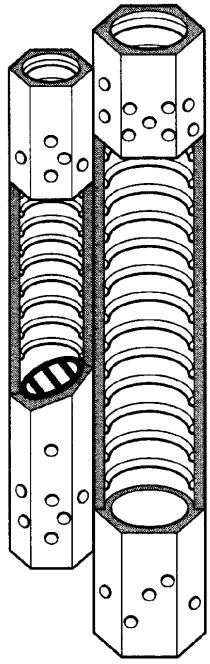

Fig. 2.1

(a) Name the tissue in which these cells are found.

.....[1]

(b) Identify and explain **two** features of these cells that adapt them to their role in transport.

feature 1 .....

role in transport .....

.....

feature 2 .....

role in transport .....

.....[4]

[Turn over

For Examiner's Use

In plants, sucrose is transported in sieve tubes.

(c) Describe a possible method for the transport of sugars through sieve tubes.
(In this question, 1 mark is awarded for the quality of written communication.)

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.....[9]

[Total : 14]

For Examiner's Use

3 Multicellular animals have transport systems.

(a) Explain why multicellular animals need transport systems.

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.....[3]

(b) Complete the table below by placing a tick (✔) or a cross (✘) in the boxes.

feature	red blood cell	lymphocyte	phagocyte
possesses a nucleus			
produces antibodies			
possesses endoplasmic reticulum			
contains haemoglobin			

[4]

[Total : 7]

[Turn over

For Examiner's Use

4 Up to 99% of the water that plants take up through their roots may be lost by transpiration.

(a) Define the term *transpiration*.

.....

.....

.....[2]

(b) Explain briefly why so much water is lost by transpiration.

.....

.....

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.....[2]

The rates of transpiration for two different species of flowering plant, **A** and **B**, were measured over several hours. One of the plants, **B**, is adapted to survive in very dry conditions. Fig. 4.1 shows the transpiration rate measured in **µg per cm^2 of leaf surface** for the two different species.

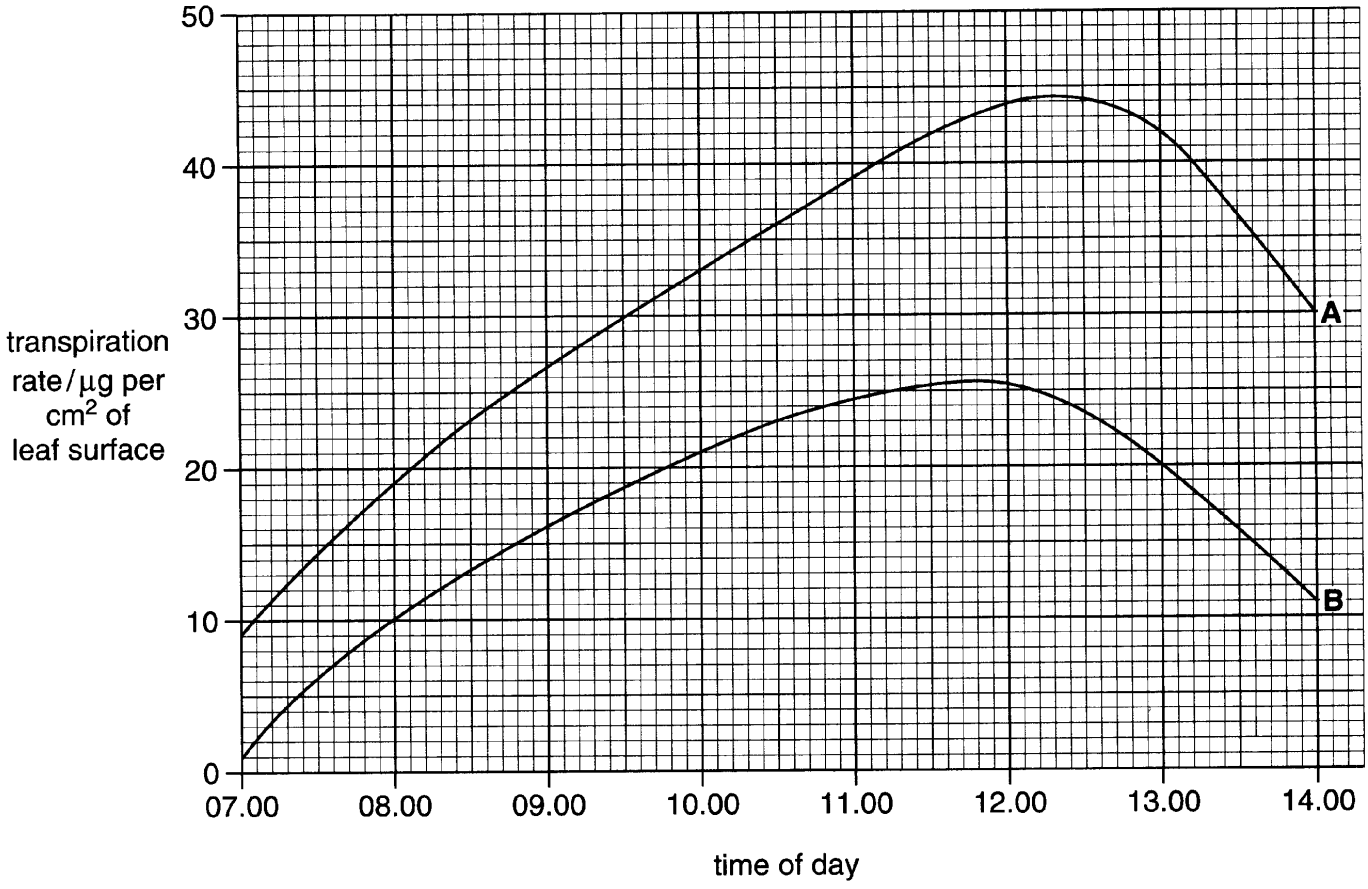

Fig. 4.1

For Examiner's Use

(c) With reference to Fig. 4.1, calculate;

(i) the difference in rate between species **A** and **B** at 10.30;

.....

(ii) the increase in rate for species **A** between 8.00 and 11.00.

.....[2]

(d) State and explain **two** possible reasons for the change in the rate of transpiration seen in both species between 8.00 and 11.00.

1. .....

.....

.....

2. .....

.....

.....[4]

Species **B** is adapted to living in dry conditions.

(e) **(i)** state the general name given to plants which can live successfully in dry areas;

.....[1]

(ii) state **two** features that such a plant may possess and explain how each of these may contribute to its success in dry areas.

1st feature .....

explanation .....

.....

2nd feature .....

explanation .....

.....[4]

[Total : 15]

[Turn over

For Examiner's Use

5 Table 5.1 compares the red blood cell count of a group of people when they were living at sea level and after they had spent several weeks at an altitude of 5 000 m.

Table 5.1

altitude/m	number of red blood cells / 10^{12} dm^{-3}
0	4.90
5 000	6.10

(a) Calculate the % increase in red blood cells after spending several weeks at high altitude. Show your working.

Answer ..... [2]

A company advertises a programme to athletes of living and training at altitude to improve their performance.

(b) Explain why the performance of an athlete at altitude would be expected to improve as a result of such training.

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.....[3]

Fig. 5.1 shows the effect of different partial pressures of carbon dioxide on the dissociation curve for haemoglobin.

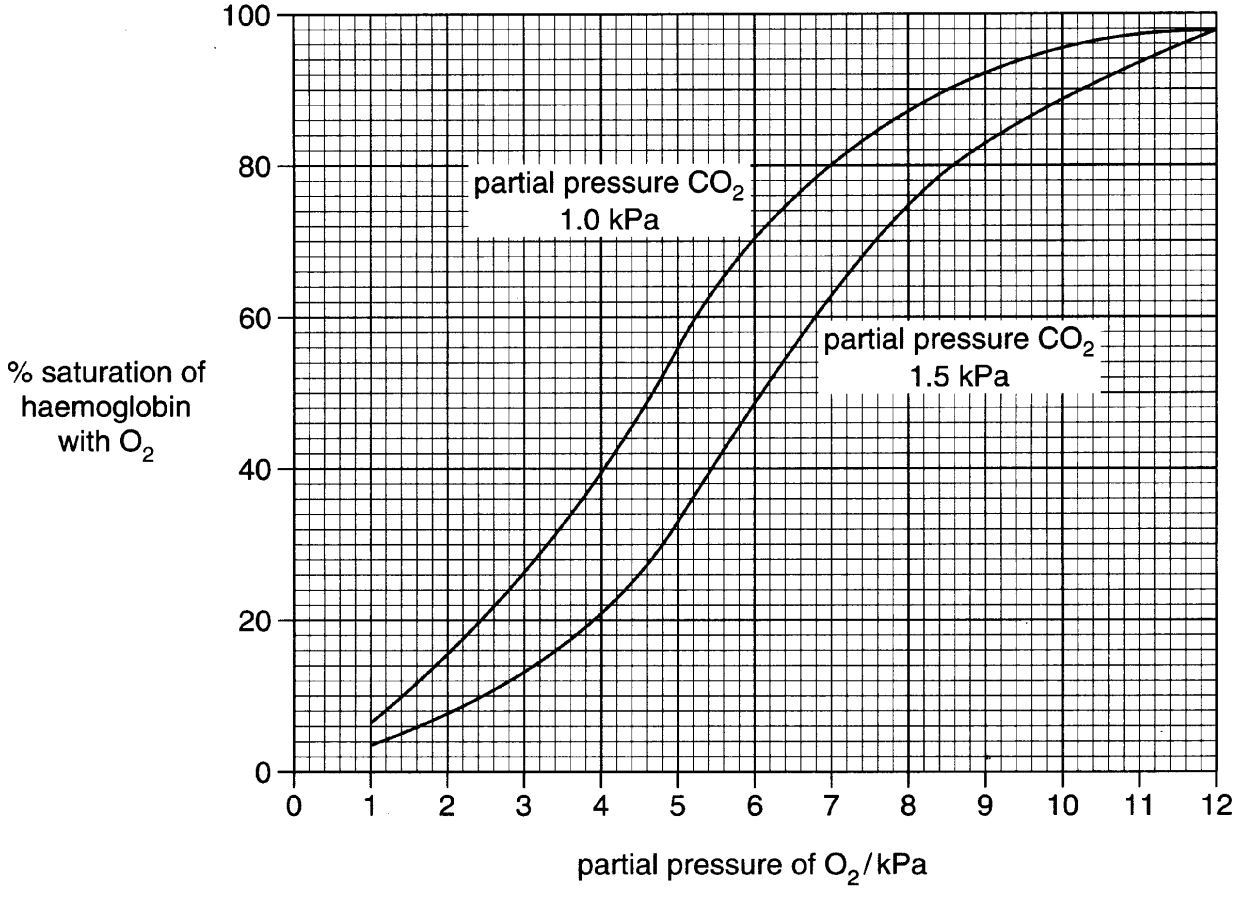

Fig. 5.1

(c) With reference to Fig. 5.1;

(i) name this effect;

.....[1]

(ii) calculate the difference in % oxygen saturation between the two partial pressures of carbon dioxide at a partial pressure of oxygen of 5 kPa;

.....[1]

(iii) outline how this effect ensures more efficient delivery of oxygen to the tissues when exercising.

.....

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.....

.....[3]

[Total : 10]

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RECOGNISING ACHIEVEMENT

Subject: Transport Code: 2803/1

Session: June Year: 2001

Mark Scheme

MAXIMUM MARK	60

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 (½) 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.

Abbreviations, annotations and conventions used in the Mark Scheme	/ = 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 **must** be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument

Question	Expected Answers	Marks
1 (a)	**A** coronary, artery / arteries / vessels; **R** cardiac **R** Veins **B** right atrium / auricle; **A** atria **C** pulmonary artery / arteries; **D** left ventricle; **R** ventricles	**4**
(b)(i)	oxygenated and deoxygenated blood / blood from two sides, would mix / AW; (so) less oxygen delivered (to the tissues) / AW; when the heart beats / AW; less blood leaves the heart / flow to body reduced / ref slower flow; ref to (possibly) lowering blood pressure; AVP; e.g. refs to double circulation altered Increase in heart rate (to compensate)	**2 max**
(ii)	ref to one way flow affected / general ref to flow back / wrong direction; less blood reaching destination / less blood leaves heart / AW; (when ventricles contract some) blood back to atria; (when ventricles relax some) blood back to ventricles (from arteries); ventricles not closed off / isolated / separated (from atria / arteries); drop in blood pressure;	**2 max**

(c) **M** pressure in ventricle exceeds that in aorta / artery;
semi lunar / eq. valves, open;
blood, enters aorta / leaves ventricle / pressure rises (in aorta / ventricle);
ventricle, contracting / systole;
R starting to contract

N pressure in ventricle drops below that in atrium;
atrio-ventricular / AV / mitral / bicuspid /, valves open; **R** tricuspid
blood enters ventricle / leaves atrium / atrial pressure, starts to drop / peaks ; **R** if linked to atrial contraction / systole.
ventricle relaxing / relaxed / in diastole;

4 max

A one ref to figures in either **M or N;**
M 8.1 – 8.5
N 0.8 – 1.2

R any refs to heart sounds

max of 3 for either M or N

(d) (ventricle has) more muscle / thick wall / AW (ora for atrium);
(high pressure) as ventricle pumps to body / a greater distance / AW;
atrium only pumps to ventricle / through the atrio – ventricular valve / AW;
less resistance;
some filling by gravity;

2 max

[Total 14]

Question	Expected Answers	Marks
2 (a)	xylem; **R** xylem <u>vessels</u>	**1**
(b)	*1 for the feature and 1 for the role in each section - apply AW throughout. Must have feature, no mark for role on its own if feature section blank.* thick (cellulose) / lignified wall / rings; prevents collapse (under tension); **R** support alone. **R** waterproofing <u>adhesion</u> linked to lignin; lack of living contents / hollow / empty; **R** dead as feature, but allow role allows free flow; end walls missing / reduced; allows free flow; develop as a completely water filled system; allows tension to move water up considerable heights; ref to pitting / pores / holes; allows lateral movement ; wide, lumen / cavity; ease of flow / large volume; stacked end on end / elongated; forms a continuous tube;	**2+2**

R refs to narrow and refs to capillary action

Mark (a) and (b) separately, but:

If (a) = xylem, credit phloem features to max of 2 marks i.e. must get Feature and role linked

If (a) = phloem – credit xylem features and roles to a max of 4 so as not to double penalise for getting the name wrong
- credit phloem features to a max of 2 marks i.e. must get feature and role linked for each mark.

(c)

1 active mechanism;
2 uses, energy / ATP;
3 source;
4 to sink;
5 named source linked to 3;
6 named sink linked to 4;
7 ref two way flow / AW;
8 loading into companion cells;
9 pumping of H ions;
10 co-transporter idea / (protein) carriers / pumps;
11 via plasmodesmata (or description) into sieve tube;
12 mass flow / bulk transport;
13 (hydrostatic) pressure;
14 ref to osmotic inflow (creating pressure gradient) / ora at sink;
15 passage via sieve plates;
16 unloading by diffusion / active;
17 AVP; could credit evidence,
18 AVP; travel to phloem via apoplast or symplast, **8 max**

t cells,
mitochondria or the high metabolic rate of companion cells,
lack of much cytoplasm in sieve tube allowing flow.
Ref to cytoplasmic streaming / chemiosmotic theory

QWC – clear, well organised using specialist terms; 1

[Total 14]

Question	Expected Answers	Marks
3 (a)	reference to size increasing / increase implied / large; need for systems faster than diffusion / diffusion too slow / AW; central regions further from surface / diffusion path too long /AW; ref to separation of different specialised areas; correct ref to surface area to volume; ref to movement of a named requirement; **A** nutrients, waste, gases but **R** food (may) have high metabolic rates / more active;	**3 max**

(b) *one mark per row*

feature	red blood cell	lymphocyte	phagocyte
possesses a nucleus	×	✓	✓
produces antibodies	×	✓	×
possesses ER	×	✓	✓
contains haemoglobin	✓	×	×

4 max

[Total 7]

Question	Expected Answers	Marks
4 (a)	loss of water vapour / evaporation; **R** loss of water from (aerial) surfaces of plants / leaves / mesophyll; diffusion (of water vapour); via stomata / into atmosphere / down a water potential (ψ) gradient;	**2 max**
(b)	Linked to gas exchange; open stomata implied; need to absorb carbon dioxide; wet surfaces (to 'dry' air) / ref to high to low water potential; AVP; e.g. large surface area, cooling effect, upward movement uptake of minerals.	**2 max**
(c)(i)	13 ;	**1**
(ii)	20 *;* **A** 6.6 per hour	**1**
(d)	increase in light; ref stomata (open) / (increased) internal surface area exposed / AW; increase in temperature; more evaporation / more KE / more diffusion / AW; ref warm air holding more water vapour / water potential gradient steeper; ref wind; removal of boundary layer / steeper gradient / AW; decreased humidity / drier; steeper water potential gradient / AW;	**2 + 2**
(e)(i)	xerophyte / xerophytic; **R** xerocyte [but accept phonetic attempts]	**1**

(ii) *one mark for the feature and one mark for how it contributes to success*

thick / waxy /waterproof, cuticle / leaf surface; **R** skin
reduces loss (via epidermis); **A** stops
reflects light;

hairs / trichomes;
trap water vapour / AW;

sunken stomata / AW;
trap water vapour / AW;

stomata shut in day; **R** smaller stomata
little / no, loss via stomata;

hypodermis / thick (walled) epidermis / AW;
reduce loss via (general) surface AW;

small internal air spaces; **2+2**
small surface area / quickly saturated / AW;

small leaves / needles / spines / fewer leaves; **A** no leaves
less area (for loss) / fewer / no stomata;
spines prevent being eaten / AW;

rolled / curled (**R** coiled) leaves;
stomata 'inside' / saturated air trapped / AW;

thick / succulent / fleshy (stem / leaf); **A** succulence. **A** (large) <u>water</u>
holds / stores water; stores;
used in adverse times / AW;
long / deep / extensive roots / shallow;
reach water;

low water potential of roots / AW;
increase uptake AW;

fewer stomata / stomata less dense;
reduced water loss / AW;

dense rosette habit / AW;
out of wind / stomata protected / AV;

tolerant of desiccation / AW;
loose water with out damage / death;

ephemeral life cycle / AW;
complete reproduction when (sufficient) water present; **2 + 2**

look out for other acceptable features::

[Total 15]

Question	Expected Answers	Marks
5 (a)	***correct answer = 2 ticks = 2 marks*** ***if answer incorrect, check the working and award a max of one mark*** 6.1 - 4.9 = 1.2; (the calculation mark if answer wrong] 100 x 1.2 4.9 = 24.48(%) take 24 – 25(%);; **R** if in excess of 3 d.p. in answer but still allow calculation mark **A** a calculation mark which ends up subtracting c. 80% from 100%	**2**
(b)	More erythropoetin / EPO; more cells / faster production / reticulocytes; more haemoglobin; (so) more oxygen carried / more oxygen to, body / tissues / cells; ref sustaining aerobic respiration; (so) more energy release; (so) more ATP; less lactate / lactic acid / oxygen deficit delayed /AW; **R** refs to lung capacity, muscle size, capillary network, myoglobin, cardiac output.	**3 max**
(c)(i)	Bohr (effect / shift);	**1**
(ii)	23;	**1**
(iii)	more respiration; more / higher partial pressue / pressure, carbon dioxide (produced); refs to H ions / carbonic acid / haemoglobinic acid; HbO / Hb releases oxygen / lower affinity for oxygen / correct DPG ref; at a given partial pressure of oxygen; ref to comparative figures; **A** use of 23% figure from above	**3 max**
		[Total 10]