

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

BIOLOGY

2803/1

Transport

Friday

19 JANUARY 2001

Afternoon

1 hour

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Candidate Name

Centre Number

Candidate
Number

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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	4	
2	20	
3	16	
4	15	
5	5	
TOTAL	60	

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

Answer all questions.

- 1 Both multicellular animals and plants can have transport systems consisting of various tubular vessels.

Complete the table below by placing a tick (✓) or a cross (✗) in the boxes.

feature	animal	plant
the contents of the vessels are pumped round the system		
the vessels link to form a circulatory system		
the vessels form a major nutrient transport system		
some of the vessels are living and some are dead		

[4]

[Total : 4]

- 2 Fig. 2.1 shows cross sections of two types of vessel from the mammalian blood system.

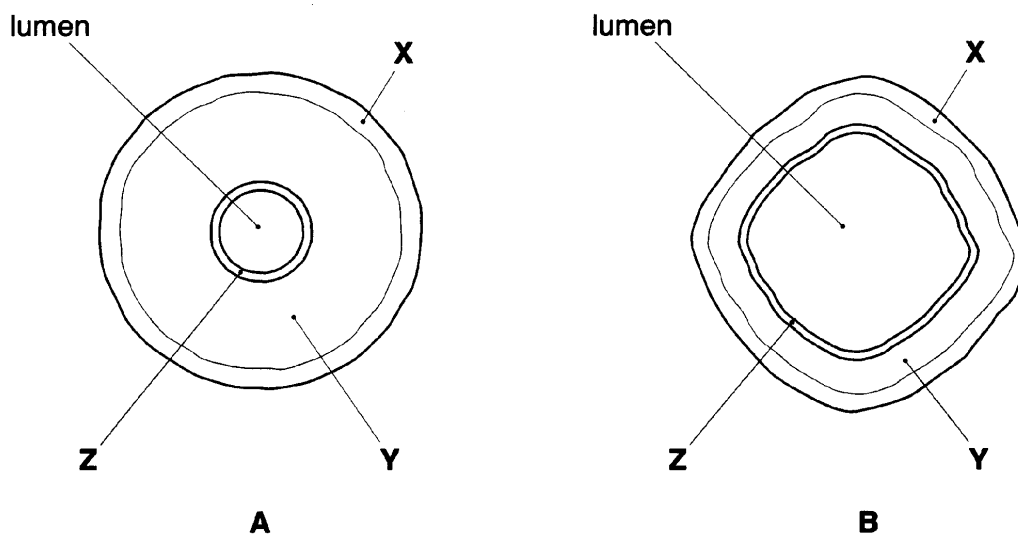


Fig. 2.1

(a) With reference to Fig. 2.1,

- (i) name the blood vessels A and B;

A

B[1]

(ii) name X to Z;

X

Y

Z[3]

(iii) describe briefly the structure of X to Z.

X

Y

Z[3]

Fig. 2.2 gives information about the blood pressure in various parts of the mammalian blood system.

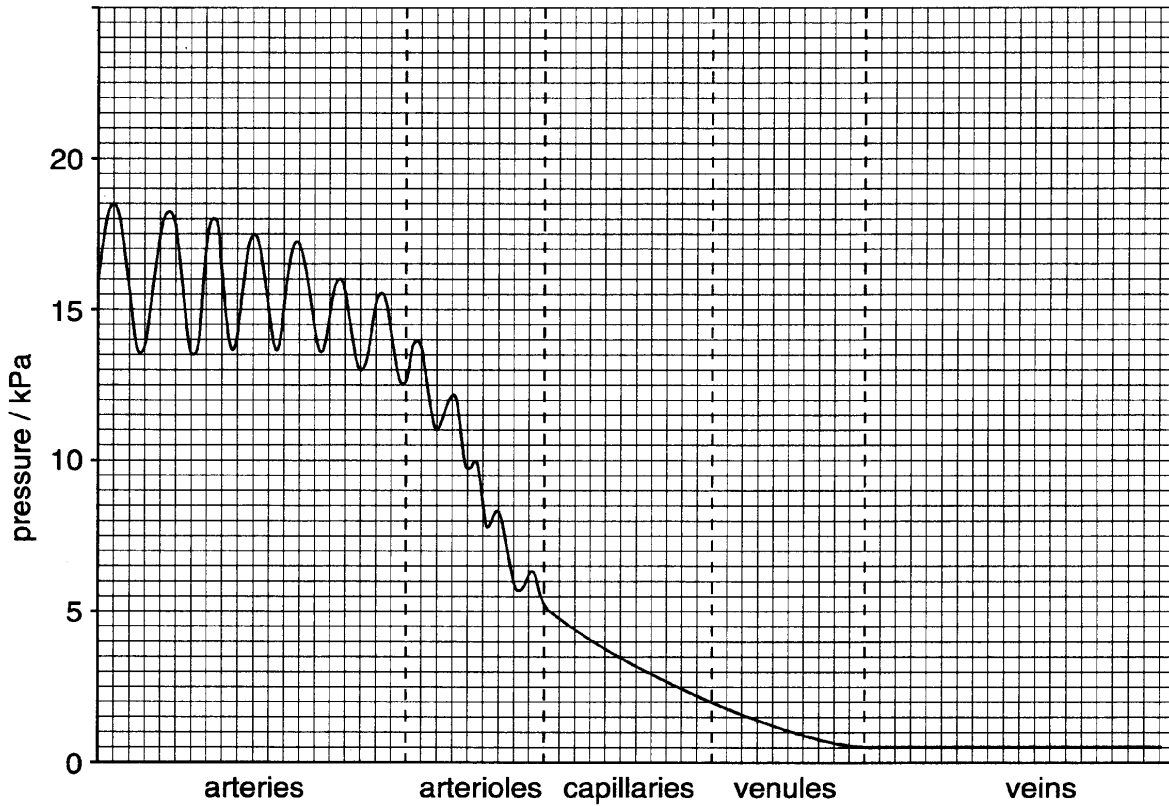


Fig. 2.2

(b) With reference to Fig. 2.2,

(i) describe the changes in blood pressure in the arteries;

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

(ii) explain the changes you have described;

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

(iii) suggest why it is important that the blood pressure drops steeply in the arterioles.

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

Fig. 2.2 shows that blood pressure is at its lowest in the veins.

(c) Explain how blood at low pressure is returned to the heart.

.....
.....
.....
.....
.....
.....[4]

(d) (i) Explain why blood contains more protein than tissue fluid.

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

(ii) State **three further ways** in which blood differs from tissue fluid.

1
2
3[3]

[Total : 20]

3 (a) Define the term transpiration.

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

Fig. 3.1 shows an apparatus used to investigate transpiration in plants.

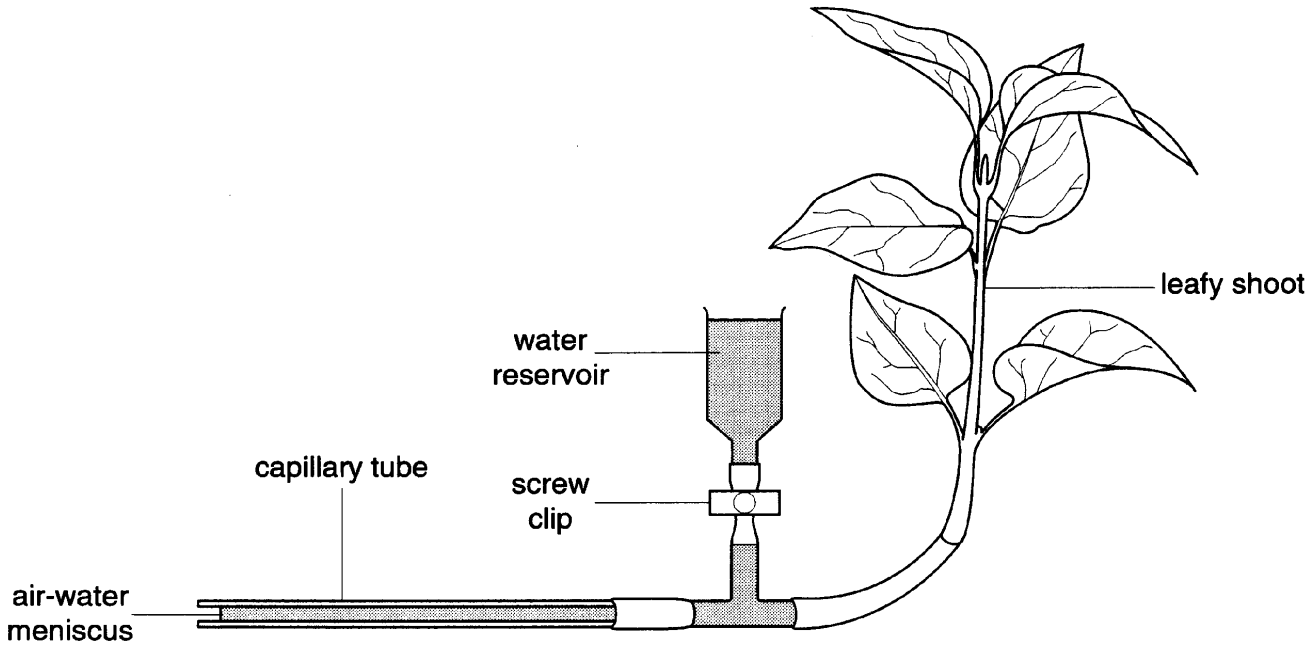


Fig. 3.1

(b) With reference to Fig. 3.1,

(i) name the apparatus;[1]

(ii) state what is measured by the apparatus;[1]

(iii) state **three** precautions that should be taken when setting up this apparatus in order to ensure accurate results.

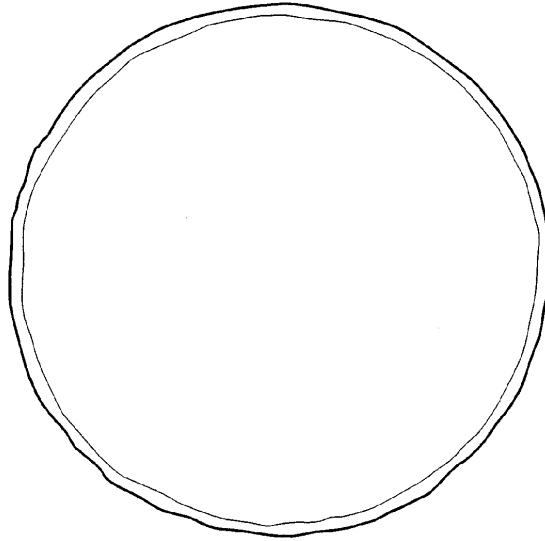
1

2

3[3]

Fig. 3.2 shows the outline of a transverse section through the root of a dicotyledonous plant.

(c) Sketch in and label the xylem and phloem in the diagram. Individual cells should **not** be shown.



[2]

Fig. 3.2

Plants can be provided with mineral nutrients by 'foliar feeding' which involves spraying solutions of mineral nutrients onto the leaves. These minerals are then transported to other parts of the plant.

(d) Name the tissue in which the minerals will be transported. Give a reason for your answer.

tissue[1]

reason

.....[1]

Fig. 3.3 shows a plant cell and the solution surrounding it. The water potential (ψ) of the cell sap and the surrounding solution is given.

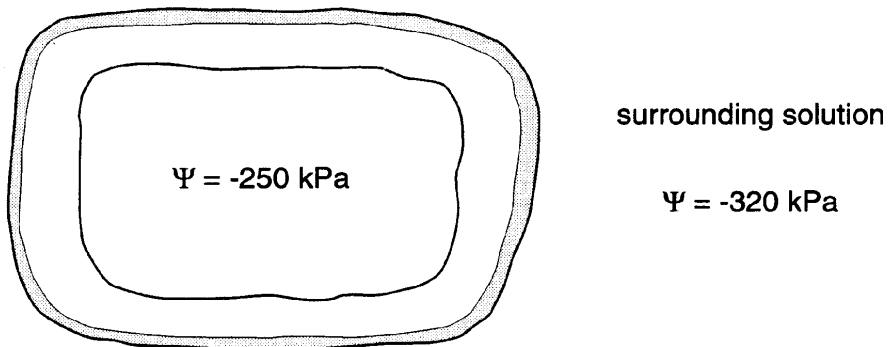


Fig. 3.3

(e) State whether water will enter or leave the cell. Explain your answer.

.....
[2]

The fungus *Ceratocystis ulmi* causes Dutch elm disease in elm trees in Europe and North America. The fungus infects the trees and secretes a toxin which causes growths into the xylem vessels eventually blocking them. Early symptoms of the disease are that the leaves at the top of the tree wilt. Then they turn yellow and dry. Finally they drop off.

(f) Explain how infection by the fungus produces the symptoms described.

.....

[3]

[Total : 16]

4 An ECG (electrocardiogram) trace shows the electrical activity within a person's beating heart. Fig. 4.1 shows a normal trace, **A**, a trace after the administration of the drug digitalis, **B**, and a trace from someone whose heart has entered a state known as fibrillation, **C**. **P** represents activity in the atrial wall, **R** contraction of the ventricle and **T** recovery of the ventricle walls.

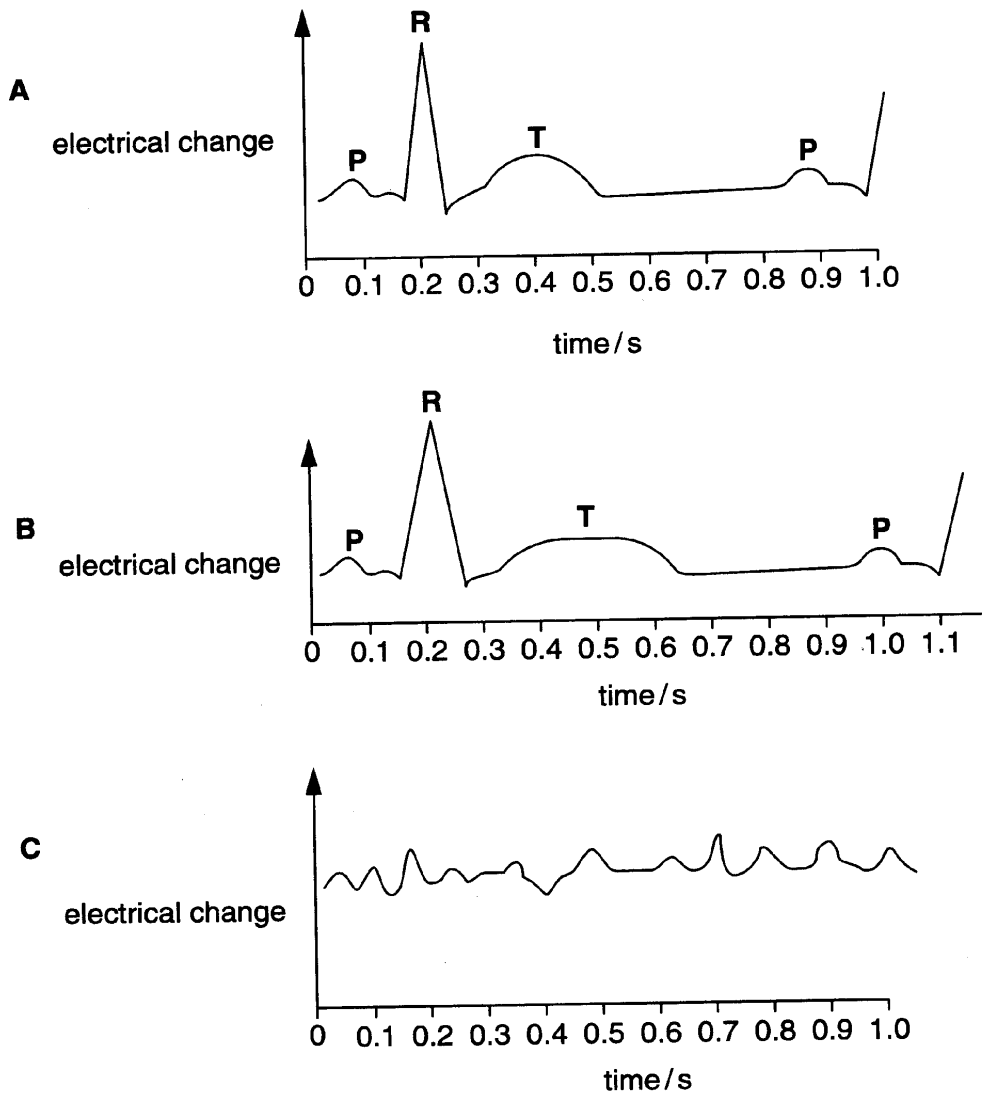


Fig. 4.1

(a) With reference to trace **A**, calculate the length of a single cardiac cycle and the number of cycles per minute.

length of a single cycle
 number of cycles per minute[2]

(b) With reference to trace **B**, state **two** effects of digitalis on heart activity.

1
 2[2]

(c) With reference to trace **C**,

(i) describe the effect of fibrillation on heart activity;

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

(ii) state **one** likely effect on the patient.

..... [1]

(d) Describe the events that occur in the cardiac cycle.

(In this question one mark is available for the quality of written communication.)

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[9]

[Total : 15]

5 Use the most appropriate word or words to complete the paragraph below on the carriage of carbon dioxide in the blood.

The carbon dioxide produced in respiring tissue diffuses into the blood where most of it enters the red blood cells. Here the enzyme catalyses a reaction resulting in the production of carbonic acid (H₂CO₃) which dissociates into hydrogen ions (H⁺) and

The hydrogen ions combine very readily with haemoglobin forming acid thus removing them from solution where they would make the blood very acidic. In this way the haemoglobin is acting as a , maintaining the blood pH close to neutral.

Some of the carbon dioxide that enters the red blood cells does not undergo the process described above, but combines directly with haemoglobin forming

[Total : 5]

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Subject: Transport Code: 2803 / 01

Session: January Year: 2001

Mark Scheme

MAXIMUM MARK	60
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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.

Mark Scheme Page 1 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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

Animal	Plant
✓	x
✓	x
✓	✓
x	✓

one mark per row

4

[Total: 4]

Mark Scheme Page 2 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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Question	Expected Answers	Marks
2 (a)(i)	A = artery, B = vein;	1
(ii)	X = tunica externa / outer coat / tunica adventitia; Y = tunica media / middle coat; Z = endothelium / tunica interna / tunica intima;	3
(iii)	X: collagen / elastic fibres / connective tissue; Y: (smooth) muscle and elastic fibres; (A) collagen if part of list Z: single cell layer / smooth surface / very thin; (A) elastin	3
(b)(i)	pulsatile / AW ; declining (slightly); amplitude declines (slightly) / AW ; ref to correct figures;	2 max
(ii)	reflects pumping of heart; ref to elastic recoil effect; detail; decrease / amplitude changes, reflect distance from the heart; AVP; e.g. ref to systole / diastole	2 max
(iii)	slows rate; allows exchange (in capillaries); reduce likelihood of damage (arterioles / capillaries); not as elastic (as arteries);	1 max

Mark Scheme Page 3 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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(c) valves;
prevent backflow / **AW**;
(action of surrounding) muscle; NOT muscle in wall of vein
pushes blood / squeezes veins;
large lumen;
little resistance;
ref to negative pressure in, chest / thorax / heart;
ref to gravity effect (from areas above the heart); **4 max**

(d)(i) proteins too large to pass out / **AW**; **1**

(ii) red blood cells, only in blood / not in tissue fluid;
more white blood cells in blood;
platelets only in blood;
ref to (hydrostatic) pressure differences;
ref to dissolved gas levels qualified;
blood in vessels / tissue fluid not in vessels;
AVP; **3 max**

[Total: **20**]

Mark Scheme Page 4 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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Question	Expected Answers	Marks
3 (a)	loss of water vapour / evaporation; from (aerial) surfaces of plants / leaves; diffusion (of water vapour) through, stomata / into atmosphere / AW ;	2 max
(b)(i)	potometer;	
(ii)	water uptake / AW ; ® rate of transpiration	
(iii)	cut shoot under water / make sure no air in xylem; insert shoot into potometer underwater / potometer set up under water; dry off leaves / avoid wetting leaves; all joints, air-tight / water-tight; (A) no air bubbles in potometer use, healthy / non-wilted, shoot; keep environmental conditions constant; cut stem at slanted angle; allow settling time (before taking measurements);	3 max
(c)	3 – 5 pointed star of xylem with phloem indicated between ‘arms’; xylem, phloem labelled correctly;	2
(d)	phloem; transports away from, leaf / source; ora for xylem	2
(e)	out of cell; down a water potential gradient / to lowest water potential / to most negative water potential;	2

Mark Scheme Page 5 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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- (f) xylem transports water / 'carries' water to leaves;
 transpiration / evaporation, pulls water up (xylem);
 this (evaporation) occurs from, leaves / stomata / aerial surfaces;
 blockage of vessels stops upward movement / **AW**;
 water lost is not replaced / transpiration still occurs;
 cells not turgid (hence wilting);
 AVP; e.g. lack of Mg or Fe gives yellowing / leaf death

3 max

[Total: 16]

Mark Scheme Page 6 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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Question	Expected Answers	Marks
4 (a)	0.8 – 0.83 <u>sec</u> / <u>s</u> / <u>second</u> ; 75 ; ecf	2
(b)	lengthens cycle (by 0.1-0.2 seconds) / fewer beats per min / slows (heart) rate; ventricular contraction time increased a little; ventricular recovery takes longer;	2 max
(c)(i)	small irregular contractions / no pattern / AW ;	1
(ii)	blood will not be pumped / heart attack / death / loss of consciousness;	1
(d)	<i>description is most likely to start at atrial systole</i>	
1	atria (full of blood) contract / atrial systole;	
2	blood into ventricles;	
3	atrioventricular valves open; (A) alternative names	
4	valves in veins stop blood returning to veins;	
5	ventricles contract / ventricular systole;	
6	blood forced into, arteries / aorta and pulmonary artery;	
7	semi-lunar valves open;	
8	atrioventricular valves shut (to stop backflow);	
9	ventricles (and atria) relax / diastole;	
10	semi-lunar valves close (to stop backflow from arteries);	
11	blood enters atria;	
12	some passes through to ventricles;	
13	effect of pressure in closing valves (semi-lunar or atrioventricular);	
14	AVP;	
15	AVP;	
	AVPs to include control by SAN, AVN, Purkyne tissue; ref to papillary muscle	8 max
	Q – clear, well organised using specialist terms;	1
		9 max
		[Total: 15]

Mark Scheme Page 7 of 7	Unit Code 2803/01	Session January	Year 2001	Version Final
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Question	Expected Answers	Marks
5	carbonic anhydrase; hydrogen carbonate ions / HCO_3^- ; haemoglobinic; buffer/description of buffering; carbaminohaemoglobin;	5

[Total: 5]