

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

BIOLOGY

2803/01

Transport

Tuesday

8 JUNE 2004

Morning

45 minutes

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name

Centre Number

Candidate
Number

| | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|
| | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; height: 20px;"></td> </tr> </table> | | | | | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%; 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 provided 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 steps in any calculations.

| FOR EXAMINER'S USE | | |
|---------------------------|-----------|------|
| Qu. | Max. | Mark |
| 1 | 7 | |
| 2 | 12 | |
| 3 | 18 | |
| 4 | 8 | |
| TOTAL | 45 | |

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

Answer **all** the questions.

- 1 Fig. 1.1 shows the structure of a single-celled organism called *Chlamydomonas* which shares many features with plant cells. Fig. 1.2 shows a cedar tree. The cells of both organisms need water to carry out their metabolic functions.

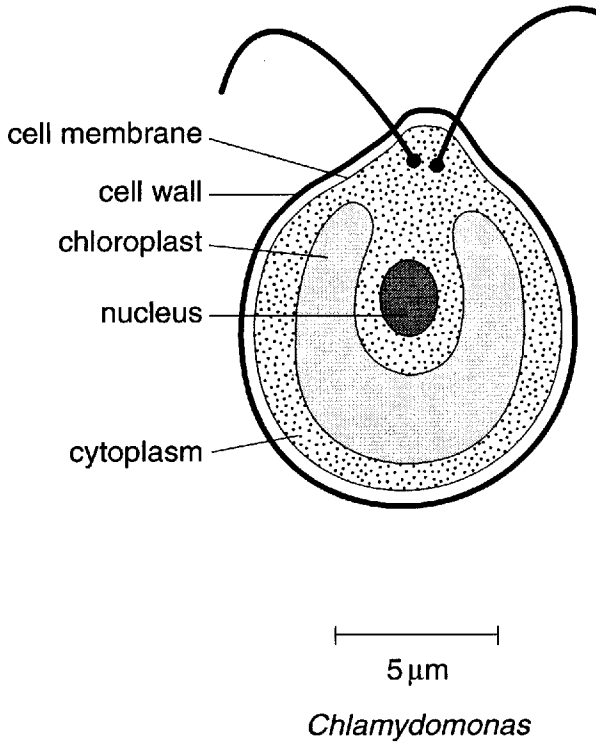


Fig. 1.1

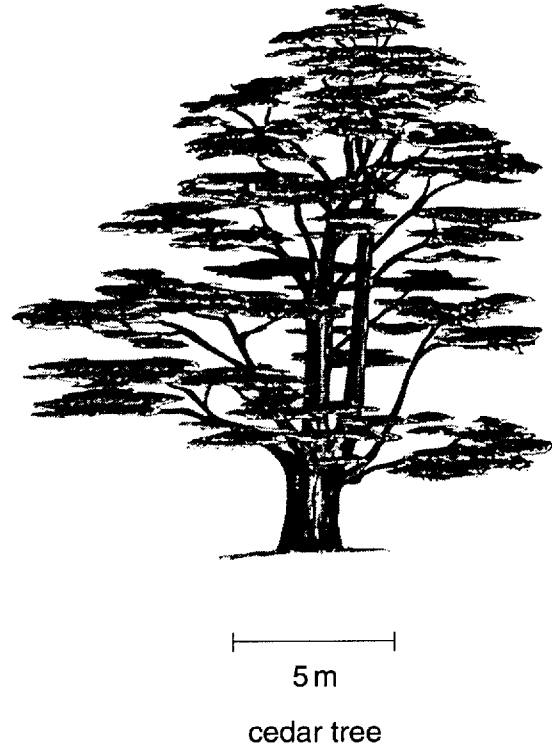


Fig. 1.2

- (a) (i) *Chlamydomonas* lives in fresh water ponds.

Explain how single-celled organisms like *Chlamydomonas* obtain water from their external environment.

.....

.....

.....

.....[2]

- (ii) Sea water contains a much higher percentage of salts than the fresh water in which *Chlamydomonas* lives.

Suggest the changes that would take place in the *Chlamydomonas* cell if it were transferred to sea water.

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

- (b) *Chlamydomonas* has no water transport system whereas the tree shown in Fig. 1.2 has a well developed system for water transport.

Explain why a large multicellular organism like a tree needs a water transport system whilst *Chlamydomonas* does not.

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

[Total: 7]

- 2 Fig. 2.1 shows the results of an investigation to compare rates of transpiration and water absorption by a plant during a hot day in summer. There was no shortage of soil water available to the plant throughout the investigation, which was carried out over 24 hours starting at midnight.

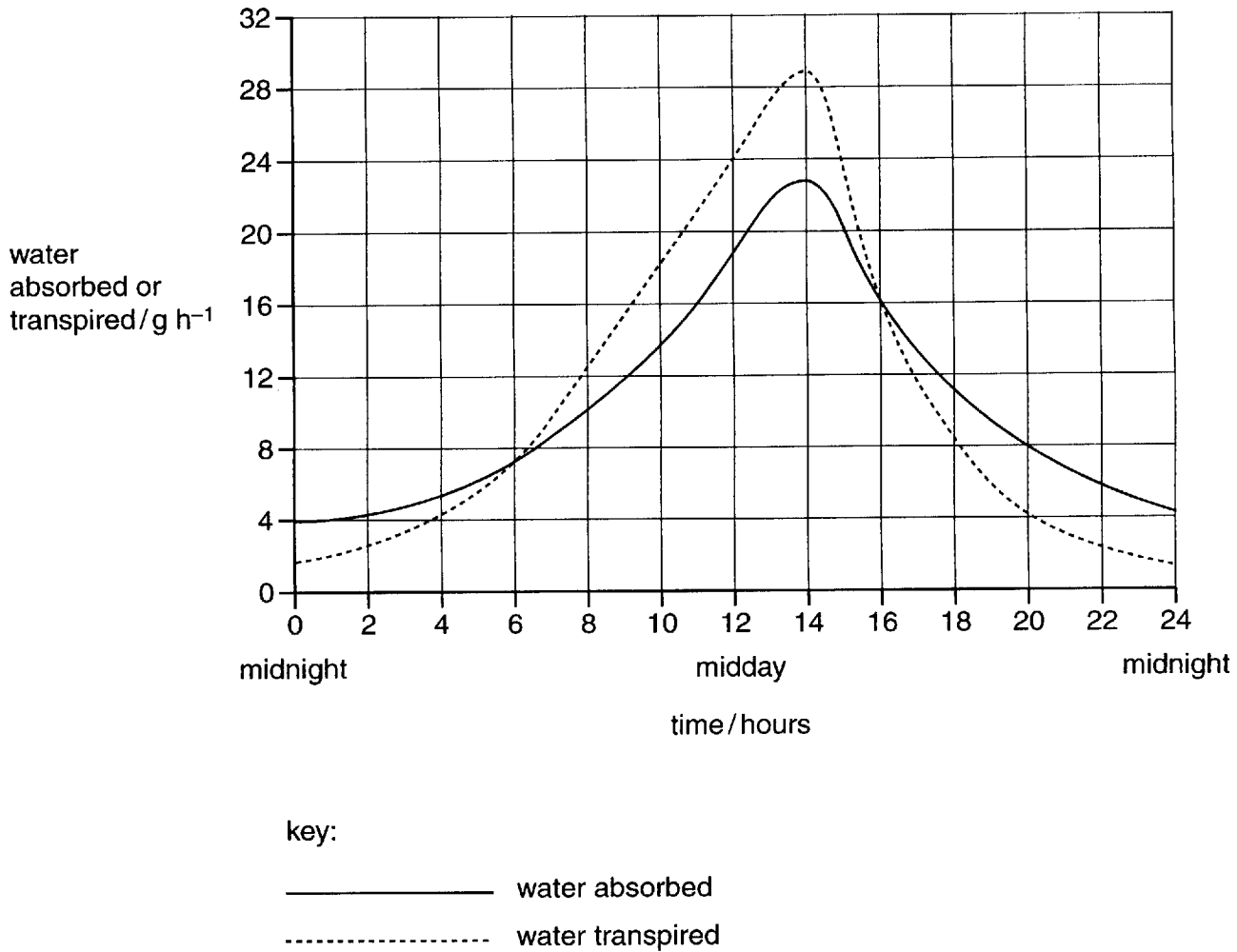


Fig. 2.1

- (a) (i) Define the term *transpiration*.

.....

.....

.....

..... [2]

(ii) Using Fig. 2.1, describe how the rate of transpiration varied over the 24 hour period **and** compare it with the rate of water absorption.

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

(iii) Calculate the percentage of the 24 hour day in which the rate of water absorption exceeds the rate of transpiration.

Show your working and **give your answer to the nearest whole number.**

Answer % [2]

(b) Explain how transpiration results in the movement of water up a plant stem.

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

[Total: 12]

3 Fig. 3.1 is a simple diagram of a mammalian heart and associated blood vessels as seen in front (ventral) view.

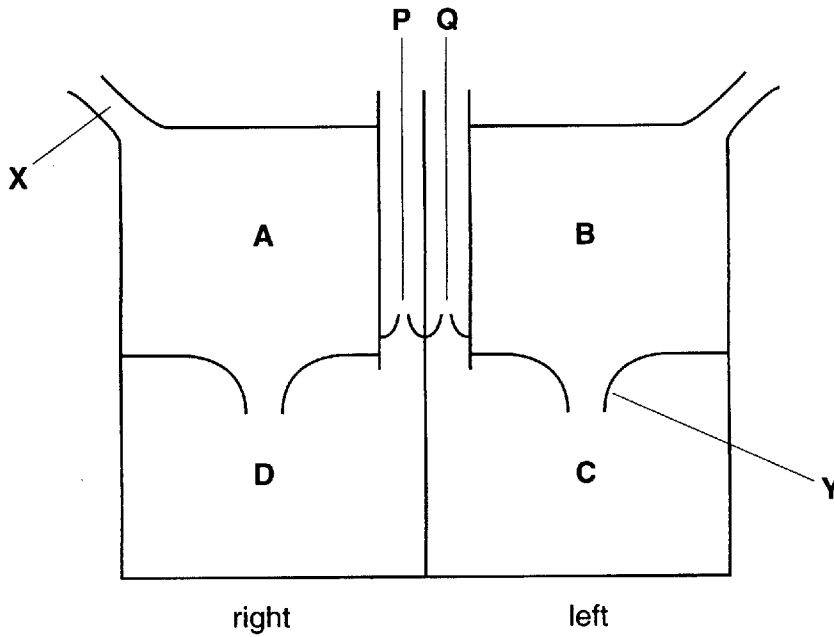


Fig. 3.1

(a) (i) Draw arrows on Fig. 3.1 to show the direction of blood flow through the **left** side of the heart. [1]

(ii) State the name of vessel **X** and valve **Y**.

vessel **X**

valve **Y**[2]

(iii) Explain why there are valves at **P** and **Q**.

.....

.....

.....

.....

.....[2]

(b) The synthesis of red blood cells is stimulated by the hormone erythropoetin (EPO) which is secreted by the kidneys. Some long distance athletes have been known to take a course of EPO as part of a training programme.

Suggest why some athletes have taken erythropoetin.

.....

.....

.....

.....

.....

.....

[2]

[Total: 8]

END OF QUESTION PAPER

Copyright acknowledgements:

Q.1 Fig. 1.2 Picture of tree from *GCSE Biology*, p305 fig. 4, by D. G. MacKean, published by John Murray, 1986.
(ISBN 0 7195 4281 2)

OCR has made every effort to trace the copyright holder of items used in this Question paper, but if we have inadvertently overlooked any, we apologise.

2803/01 Transport

June 2004

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.

| | | | | |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|
| Mark Scheme Page 3 of 6 | Unit Code 2803/01 | Session June | Year 2004 | 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 R = reject A = accept () = 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) (i) | osmosis; down water potential gradient / from high to low water potential / implied; ref to partially / differentially / selectively, permeable membrane; | 2 max |
| (ii) | lose water; R less uptake metabolism affected / (may) die / AW; R in context of salt uptake plasmolysis / flaccid / less turgid / description; R shrivelled, dehydrated AVP; e.g. adaptive responses qualified, such as encysting / mobilise solute / refs to altering water potential to reduce water loss | 2 max |
| (b) | <i>credit answers explaining why Chlamydomonas does not need a water transport system</i> distance in tree is greater / AW; e.g. roots far from aerial parts / AW; not all tissues / cells in contact with water / AW; diffusion too slow / AW; AVP; e.g. outer layers waterproofed / ions carried in water / <i>Chlamydomonas</i> has large surface area:volume R refs to greater quantities needed | 3 max |
| [Total: 7] | | |

| | | | | |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|
| Mark Scheme Page 4 of 6 | Unit Code 2803/01 | Session June | Year 2004 | Version Final |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|

| Question | Expected Answers | Marks |
|------------------|---|--------------|
| 2 (a) (i) | <p>loss, of water vapour / by evaporation; <u>diffusion</u> into, atmosphere / air / environment / out of plant; via stomata or from, leaves / aerial parts; <i>max 1 if response starts with 'transpiration is the upward movement of water'</i></p> | 2 max |
| (ii) | <p style="text-align: center;"><i>Descriptions</i></p> <p>1 increases then decreases / peaks / higher by day / lower by night; 2 correct ref to figures to support e.g. highest at 1400 / lowest at midnight / ref to one rate with units;</p> <p style="text-align: center;"><i>Comparisons</i></p> <p>3 (rate of) transpiration greater, in day/ when hotter / 6 to 16 hours; ora 4 (rate of) transpiration less, at night / when cooler / 16 to 6 hours; ora 5 rates equal at 6 <u>and</u> 16 hours; 6 both peak, at the same time / at 14 hours / accept midday; / AW; 7 both lowest at, same time / midnight; 8 transpiration rise is steeper; ora 9 transpiration fall is steeper; ora 10 any one figure quote for rate with units that supports comparison points above;</p> | 4 max |
| (iii) | <p><i>award two marks if correct answer (58) is given – must be rounded up 58 (%);;</i> <i>max 1 if not whole number, award calculation mark for getting 14 hours ecf If wrong time period read, but correct % calculated from it = 1 mark</i></p> | 2 |
| (b) | <p>loss of water from mesophyll; cell walls; more drawn from, cytoplasm / cell / AW; cohesion of water molecules; hydrogen / H, bonds; water under tension / ref to hydrostatic pressure gradient implied; A water 'pulled' / 'drawn' R sucked via, symplast / apoplast / vacuoles / description / AW; (water from) xylem / xylem vessels; ref to water potential gradient;</p> | 4 max |

[Total: 12]

| | | | | |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|
| Mark Scheme Page 5 of 6 | Unit Code 2803/01 | Session June | Year 2004 | Version Final |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|

| Question | Expected Answers | Marks |
|------------------|---|--------------|
| 3 (a) (i) | arrows through correctly; R if both sides shown | 1 |
| (ii) | X = vena cava; Y = bicuspid / atrioventricular / AV / mitral (valve); R tricuspid | 2 |
| (iii) | when ventricle / heart, relaxes; A diastole; pressure lower (in ventricle implied); ora valves stop back flow / AW; R incorrect qualification | 2 max |
| (b) (i) | A = 2; C = 16; D = 9; | 3 |
| (ii) | A / atrium, only pushes, to ventricle / short distance / AW; A effect of gravity C / left ventricle, pushes all round body / to systemic system / AW; D / right ventricle (only) pushes to lungs / to pulmonary system / AW; qualification for C or D e.g. greater distance / resistance or more, force / pressure; ora for right ventricle <i>allow ecf if C & D wrong way round in (b) (i)</i> | 3 max |
| (c) | 1 cardiac muscle is myogenic / description; 2 SAN / sinoatrial node / pacemaker; 3 (in wall of) right atrium; 4 wave of electrical activity / impulse / depolarisation / excitation / AW; 5 spreads across atria / causes atria to contract; 6 stopped / AW (by, fibres / septum), between atria and ventricles; 7 delay allows atrial systole to be completed (before ventricular systole); 8 atrioventricular node / AVN; 9 impulse passes down / to, Purkyne (Purkinje) fibres / bundle of His; 10 contraction from base upwards; 11 both ventricles contract together / AW; 12 AVP; e.g. external nervous control in response to, temp / CO ₂ / etc delay of 0.1 s at AVN hormone control | 6 max |
| | QWC – legible text with accurate spelling, punctuation and grammar; | 1 |

[Total: 18]

| | | | | |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|
| Mark Scheme Page 6 of 6 | Unit Code 2803/01 | Session June | Year 2004 | Version Final |
|-----------------------------------|------------------------------------|------------------------|---------------------|-------------------------|

| Question | Expected Answers | Marks |
|-------------------|---|--------------|
| 4 (a) (i) | <p>(equivalent to) concentration / AW, of oxygen in, atmosphere / air / tissues; proportion of atmospheric pressure produced by oxygen / AW; at high altitude, atmospheric pressure is lower; ora A 'air is thinner' therefore pO_2 is lower / 15 kPa v 21 kPa; ora</p> <p><i>fourth point can only be given in context of point 2 or 3. It cannot be given for just stating partial pressure is lower / quoting the figures unqualified</i></p> | 2 max |
| (ii) | <p>haemoglobin / rbc / blood less saturated with oxygen / less oxygen carried in blood / AW; altitude sickness; hypoxia / anoxia; A shortage of oxygen to tissues changes in, breathing pattern / heart rate / pulse rate; dizziness / weakness / disorientation / hallucinations / headaches / AW; (possible) death / coma; brain damage / lung damage / fluid accumulation or oedema in these organs / ref to arteriole / capillary dilation in these organs ; AVP; e.g. ref to alkalaemia / described / alkaline urine / raised blood pH</p> | 4 max |
| (b) | <p>more haemoglobin; get more oxygen round body; more / longer, <u>aerobic respiration</u> (when exercising); ora for <u>anaerobic</u> reduces, lactate / lactic acid; A delays oxygen debt; more, ATP / energy release; R producing / making energy enhanced performance / AW; A exercise for longer or harder increased carbon dioxide removal; ref to undetectability (as a natural product);</p> | 2 max |
| [Total: 8] | | |