



RECOGNISING ACHIEVEMENT

JANUARY 2003

ADVANCED GCE UNIT

MARK SCHEME

MAXIMUM MARK: 60

Syllabus / Component: 2806/03

Biology Practical Examination

Paper Set Date: 23/01/03

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 answers 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 marks should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

Planning Exercise

The mark scheme for the planning exercise is set out on page 4. The marking points **A** to **R** follow the coursework descriptors for Skill P.

Indicate on the plans where the marking points are met by using a tick and an appropriate letter. There are 14 marking points for aspects of the plan and two marks for quality of written communication (QWC).

Practical Test

Pages 5, 6, and 7 have the mark scheme for Questions 1 and 2 for the Practical Test.

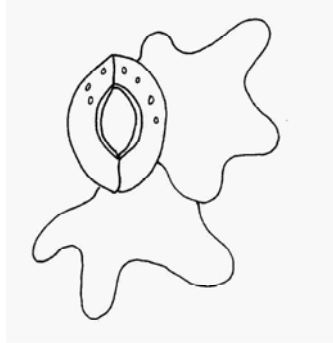
A2 Biology. Planning exercise

Checking Point	Descriptor	The candidate
A	P.1a	Plans a suitable procedure that involves making measurements of transpiration rate and stomatal opening;
B	P.1a	Gives a prediction about the relationship between rate of transpiration and opening – maybe in form of a graph;
C	P.1b	Selects suitable equipment and materials to determine transpiration rate and stomatal opening e.g. potometer, graticule / porometer;
D	P.3a	Identifies variables to change or control, e.g. temperature, light intensity, wind speed;
E	P.3b	Decides on appropriate number of measurements to take in order to find a relationship between stomatal opening and transpiration rate;
F	P.3b	Plans to carry out repeats (minimum of three);
G	P.5a	Uses appropriate scientific knowledge and understanding in developing a plan e.g. stomatal mechanism / effects of factors on transpiration;
H	P.5a	Uses results from preliminary work, previous practical work or identified secondary sources in developing a plan;
I	P.5a	Refers to a safety aspect / gives a risk assessment;
J*	P.5b	Gives a clear account, logically presented with accurate use of scientific vocabulary (QWC);
K	P.5b	Describes way(s) of obtaining precise results e.g. fine bore potometer tubing, ways of improving timing method of bubble travel / measure stomata at random / use graticule eyepiece;
L	P.5b	Describes ways of obtaining reliable results by including replicates to calculate means;
M	P.7a	Uses information from at least two identified sources , e.g. preliminary work / class practical and a text book / web site etc;
N	P.7a	Shows how data is to be presented in form of a table;
O	P.7a	Links plan throughout to AS and A2 scientific knowledge and understanding;
P*	P.7a	Uses spelling, punctuation and grammar accurately (QWC);
Q	P.7b	Explains how data would be interpreted to find answer to the investigation / suggests a suitable statistical test e.g. Spearman rank;
R	P.7b	Comments on precision and / or reliability e.g. by commenting on constraints in maintaining temperature regimes / interference effects of one procedure on the other / need for equilibration before taking readings;

Point mark up to **14** by placing letters (A to R **excluding J and P**) in the margin at appropriate points.

Then award **1** mark for each of J and P (QWC).

Total: 16

Question	Expected Answers	Marks
1 (a)	<p><i>Drawing:</i></p> <p>size of guard cells:epidermal cells; (guard cell smaller than epidermal cell) see <i>sketch below</i> correct shape of guard cells; thickening of inner wall of guard cells; (thicker than other walls) presence of chloroplasts; shape of epidermal cells;</p>	5
		
(b) (i)	<p>evidence of plasmolysis; A flaccid guard cells move closer together; pore size decreases / stomata closed; decrease in volume of guard cells / guard cells 'straighter';</p>	max 2
(ii)	<p>loss of water from guard cells / decrease in volume; (if not awarded in (i)) due to solute potential being lower than water potential of the cell / AW; loss of turgor / flaccid; leading to change in shape of cells; ref to ion movement;</p>	5
(c) (i)	<p>recovery from plasmolysis; A turgid pore size increases / stomata open; guard cells gain water / increase in guard cell volume; appropriate ref to shape of guard cells;</p>	2
(ii)	<p>water potential of guard cell is lower than solute potential of B; water enters / increase in guard cell volume; (if not awarded in (i)) turgor restored; ref to ion movement; description of stomatal opening;</p>	5
(d)	light;	1
		[Total: max 17]

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- 2 (a) A: colour comment; (light blue / colourless)
settling comment;
C: colour comment; (dark blue)
settling comment; 4
- (b) blue colour restored; 1
- (c) (i) blue;
as in A / retained / returned / any appropriate qualification; 2
- (ii) no, because it occurs in B after boiling;
enzymes would have been denatured;
loss of tertiary structure / breakage of bonds; 3
- (d) reduction of the methylene blue has occurred in A;
ref optimum temperature;
but not in C;
must be enzyme-controlled;
boiling denatured the enzymes in yeast;
ref dehydrogenation;
(aerobic) respiration; max 6
- (e) oxidation of the reduced methylene blue;
from air / oxygen into the tube; 2
- (f) hydrogen acceptors / co-enzymes / **A** NAD; **R** NADP 1
- (g) respiration / glycolysis / Krebs cycle / oxidative phosphorylation; 1
- (h) remove, solid / sediment / yeast cells;
idea that this will obscure the colour reading of the methylene blue; 2
- (i) allows more accurate readings of the colour changes;
numerical data can be used more easily for rate comparisons; **A** quantitative data
makes it possible to plot a graph; max 2

- (j)
- 1 progressive decrease in percentage absorbance;
 - 2 fast at beginning / some description of change in trend;
 - 3 intensity of the (blue) colour decreases;
 - 4 because methylene blue is reduced;
 - 5 levels out after 11 minutes;
 - 6 all the methylene blue is reduced;
 - 7 7 minute reading is anomalous;
 - 8 possible reason given;
 - 9 ref to figures to make a comparison;
 - 10 dehydrogenases;
 - 11 (matrix of) mitochondria / in cytoplasm;
 - 12 further detail; e.g. methylene blue takes place of NAD
 - 13 sketch graph;
 - 14 AVP;
 - 15 AVP;

max 9

[Total: max 27]