

**2806/03 Biology Practical Examination (A2)**

**June 2004**

**Mark Scheme**

## ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

You are advised to destroy all draft versions.

1. 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.
2. Please ensure that you use the **final** version of the Mark Scheme.
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.

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### **Planning Exercise**

The mark scheme for the planning exercise is set out on page 4. The marking points **A** to **T** 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.

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*A2 Biology. Planning exercise.*

<b>Checking Point</b>	<b>Descriptor</b>	<b>The candidate</b>
A	P. 1a	Plans a suitable procedure that includes adding tomato extracts to cress seeds;
B	P. 1a	Provides a prediction about effect of extract on germination / growth of seeds, e.g. extract inhibits germination / growth of seeds;
C	P. 1b	Selects appropriate equipment to make extract, germinate and grow seeds and measure effect of extract;
D	P. 3a	Identifies at least two variables to control, e.g. volume of extract added to seeds, time seeds left with extract, no of seeds, watering regime;
E	P. 3b	Decides on number of measurements to take, e.g. effect of same concentration of extract on at least 20 (or 0.5 g) of seeds;
F	P. 3b	Decides on a suitable range of observations, minimum of four treatments, uses solvents with extract and controls without extracts;
G	P. 5a	Uses previous practical work, results from preliminary work, or identified secondary source in developing a plan;
H	P. 5a	Uses appropriate scientific knowledge and understanding in informing a plan, e.g. enzyme inhibition, mitosis, gibberellins / ABA, respiration;
I	P. 5a	Refers to safety, i.e. gives hazard and precaution, e.g. use non-polar solvents in fume cupboard, wear gloves handling fungicide-treated seeds;
J	P. 5b	Describes ways of producing precise results, e.g. not counting same seed twice, weighing seeds before germinating, evaporating extracts to dryness and dissolving known mass of residue to obtain different concentrations;
K	P. 5b	Describes way(s) of obtaining quantitative results, e.g. percentage germination / measures radicles / dries to constant mass;
L*	P. 5b	<i>Gives a logical, clearly written account with accurate use of scientific terminology (QWC);</i>
M	P. 7a	Uses information from at least <b>two</b> identified sources in developing a plan e.g. preliminary work / class practicals / text books / web sites;
N	P. 7a	Comments on nature / solubility of inhibitor;
O	P. 7a	Shows how data (germination and growth) would be presented in the form of a table including units;
P*	P. 7a	<i>Uses spelling, punctuation and grammar accurately (QWC);</i>
Q	P. 7b	Justifies main aspect(s) of strategy, e.g. range of concentrations used / time for which extracts left;
R	P. 7b	Comments on constraints / variables to take account of e.g. extract from different tomatoes / size of cress seeds / measuring growth;
S	P. 7b	Explains how data on germination will be analysed to see effect of extract, e.g. graph of concentration of extract v percentage germination;
T	P. 7b	Explains how data on growth will be analysed to see effect of extract, e.g. graph of concentration of extract v length of root / dry mass;

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

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

**Total: 16**

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<b>Question</b>	<b>Expected Answers</b>	<b>Marks</b>
1 (a)	table; temp in first column with units, no units in table; time in second column with units, no units in table; makes and records at least four temperatures times and rates; results recorded in s; calculates $1000/t$ correctly; results show correct trend;	<b>max 6</b>
(b)	appropriate (line) graph; axes round right way (temperature = x axis, time taken / rate = y axis); axes labelled and scaled, units in ascending order; makes good use of available space; points accurately plotted; points joined by straight lines / line of best fit if justified; <b>R</b> if extrapolated	<b>max 5</b>
(c)	identifies trend (with temp increase, time decreases / rate increases); ref to shape of curve; quotes data / uses figures (temp <u>and</u> time / rate); refers to doubling of rate; refers to anomalies; <b>A</b> states there are none	<b>max 4</b>
(d) & (e)	1. states dehydrogenases catalyse <u>oxidations</u> ; 2. during, glycolysis / link reaction / Krebs cycle; 3. producing reduced, FAD / NAD / coenzymes; 4. which provide, H atoms / electrons for, electron transport chain / oxidative phosphorylation; 5. on inner mitochondrial membrane / crista; 6. further detail of electron transport e.g. ref to chemiosmosis / ATP synthesis;	<b>6</b>
(f)	uses correct rates from table; calculates $Q_{10}$ correctly; $Q_{10} = 2 \pm 0.2$ ;	<b>3</b>
(g)	1. judging end point difficult; 2. maintaining temperature difficult; 3. temperature of yeast (and TTC) not reached that of water bath; 4. consecutive tests leads to inconsistent end points / lack of colour chart; 5. inconsistent volumes due to, syringes / foam on yeast; 6. absence of replicates; 7. yeast multiplies with time; 8. lack of, substrate / oxygen, with time; 9. build up of, alcohol / waste products; 10. pH decreases with time; 11. suggests damage to yeast cells from osmotic effects of, sugar / alcohol / TTC;	<b>max 5</b>

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(h) *Advantages*

1. does not rely on judging when colour appears / AW;
2. allows volume of oxygen to be measured;
3. can be used for a variety of organisms;
4. allows for repeat with same yeast sample;
5. no, build up of CO<sub>2</sub> / pH change;

*Disadvantages*

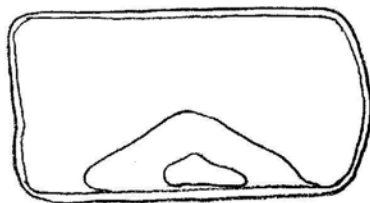
6. insulating effect of air in boiling tube;
7. does not take account of pressure effects;
8. ref to possibility of leaks;
9. difficult to reset apparatus;
10. more time for limiting factors to take effect;
11. ref to time left to equilibrate ;

max 6

**[Total: max 28]**

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Question	Expected Answers	Marks
2 (a)	seed in iodine solution = dark blue in endosperm; seed stained in Sudan III = red in embryo;	2
(b) (i)	1. starch, insoluble / compact / easily hydrolysed; 2. starch is a source of glucose; 3. starch / glucose, for, energy release / ATP synthesis / respiration; <b>R</b> energy store 4. (also) for cellulose synthesis; 5. lipid is a source of fatty acids; 6. lipid / fatty acids, used for, energy release / ATP synthesis / respiration; <b>R</b> energy store 7. provides, more / twice as much, energy as carbohydrate; <b>A</b> 'more turns of Krebs cycle'; 8. (also) for phospholipids / membranes; 9. ref cholesterol for membranes;	6 max
(ii)	carbohydrate / starch, (mostly) in endosperm; lipid (mostly) in embryo;	2
(iii)	glucose, soluble / easily translocated / moved to growing points; lipid, less soluble / less easily translocated, than glucose; but does not need to be since already in embryo; AVP; e.g. needs more starch since only half as much energy as lipid	2 max
(c) (i)	clear, continuous, sharp lines for drawing; seed coat, embryo and endosperm tissues distinguished (need not be identified); correct, proportions of tissues / shape of seed; two areas (plumule) drawn in embryo;	4



- (ii) 1. gibberellins produced by embryo;  
2. gibberellins act in endosperm;
- 2

**[Total: max 16]**