



RECOGNISING ACHIEVEMENT

JUNE 2002

ADVANCED GCE UNIT

MARKING SCHEME

MAXIMUM MARK: 60

Syllabus / Component: 2806/03

**Biology: Unifying Concepts
Experimental Skills 2**

Paper Set Date: 21/05/02

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.

| | | |
|---|---------------|--|
| 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 |
| | () | = words which are not essential to gain credit |
| | <u> </u> | = (underlining) key words which must be used to gain credit |
| | ecf | = error carried forward |
| | A | = accept |
| | AW | = alternative wording |
| | ora | = or reverse argument |

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).

Pages 5 and 6 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 measuring rate of respiration using given apparatus with and without carbon dioxide absorbent; |
| B | P. 1a | Gives a prediction about RQ – based on main storage substance(s) in mung beans; |
| C | P. 1b | Selects further appropriate equipment, e.g. water baths, thermometers, timing devices; |
| D | P. 3a | Describes how to take readings from the respirometer by marking / scaling the <u>capillary tubing</u> . R move syringe to restore position of manometer fluid; |
| E | P. 3a | Identifies a key factor to control e.g. temperature / age of seeds / stage of germination; |
| F | P. 3b | States formula for RQ <u>and</u> uses measurements with and without carbon dioxide absorbent; A KOH / NaOH pellets |
| G | P. 3b | Takes a <u>series</u> of readings from the same mung bean; |
| H | P. 5a | Uses appropriate (A2) scientific knowledge and understanding in developing a plan - reference to an equation to show respiration of any <u>one</u> substrate |
| I | P. 5a | Uses results from preliminary work, previous practical work or identified secondary source in developing a plan; |
| J | P. 5a | States appropriate precautions in strategy; e.g. allowing respirometer to stabilise / use of water bath |
| K | P. 5a | Refers to a safety aspect; e.g. use of strong alkali |
| L* | P. 5b | Gives a clear account, logically presented with accurate use of scientific vocabulary (QWC); |
| M | P. 5b | Describes way(s) of obtaining precise results by checking for constant uptake of oxygen; e.g. by plotting a graph |
| N | P. 5b | Converts linear results from respirometer to volumes / states conversion unnecessary as diameter of tubing is uniform; |
| O | P. 7a | Uses information from at least two identified sources ; e.g. preliminary work / class practical and a text book / web site etc |
| P | P. 7a | Shows how data is to be presented in form of a table / graph; |
| Q* | P. 7a | Uses spelling, punctuation and grammar accurately (QWC); |
| R | P. 7a | Explains how data collected would be used to calculate RQ; |
| S | P. 7b | Comments on precision and reliability with reference to seeds; |
| T | P. 7b | Discusses limitations in terms of limited supply of oxygen / discusses how to prevent anaerobiosis or states correction needed for possible CO ₂ absorption by soda lime / capillary action; |

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

Then award **1** mark for each of L and Q (QWC).

Total: 16

| Question | Expected Answers | Marks |
|-----------|--|------------------------|
| 1 (a) | full set of results recorded; significantly lower in K3; | 2 |
| (b) (i) | carbon dioxide; | 1 |
| (b) (ii) | replace water with lime water or equivalent; | 1 |
| (c) | yeast is able to metabolise / respire both sugars; accurate statement about rate(s); reference to monosaccharide and disaccharide; (A) simple and complex sugars explanation of rate comparison; (e.g. faster diffusion of <u>smaller</u> molecule / greater mass of substrate / longer time taken to hydrolyse sucrose) | 4 |
| (d) | better temperature control; extend equilibration period; take more readings or take repeats; measure gas more accurately; <i>either</i> take means; compare using a t-test (or other appropriate test); <i>or</i> plot cumulative data; compare gradients; | 6 max |
| (e) | yeast is unable / less able to use / metabolise / respire lactose; due to lack of appropriate enzyme / unable to enter yeast; | 2 |
| (f) (i) | pink colour (anywhere in tube); | 1 |
| (f) (ii) | TTC has been <u>reduced</u> ; by dehydrogenases / oxido-reductases; in / by yeast / cells; in mitochondria; during respiration; leading to yeast staining red; | 5 max |
| (f) (iii) | respiration is occurring in all four tubes; reduction / pink colour is independent of the type of carbohydrate / substrate / sugar; or the presence of any carbohydrate; because of substrate in yeast cells; | 4 |
| | | [Total: 25 max] |

| Question | Expected Answers | Marks |
|-----------|--|-------------|
| 2 (a) (i) | bracket correct showing starch in cortex; | 1 |
| (ii) | <i>drawing</i> shape of cells; thin walls; starch grains shown in groups of 2,3 or 4; accurate size; number of grains in cells (10-30); angular shape of grains; with contents shown; | 6 max |
| (iii) | from leaves / reference to photosynthesis; sugar / sucrose / photosynthetic product translocated / passed down; R starch passed down | 2 |
| (b) (i) | no mark awarded | |
| (ii) | Aa; | 1 |
| (iii) | alleles segregate / separate; (ACCEPT) A and a segregate / separate in meiosis; pass into <u>haploid</u> grains; | 3 |
| (iv) | 1:1; | 1 |
| (v) | correct E values; calculation correct; df = 1 chosen; correct p value for calculated value of χ^2 and given df; correct interpretation about 1:1 ratio / ratio given in (b) (iv); | 5 |
| | | [Total: 19] |