CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/32**

Paper 3 Advanced Practical Skills 2 **May/June 2024**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

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6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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This mark scheme will use the following abbreviations:

;	separates marking points
/	separates alternatives within a marking point
()	contents of brackets are not required but should be implied / the contents set the context of the answer
R	reject
A	accept (answers that are correctly cued by the question or guidance you have received)
I	ignore (mark as if this material was not present)
AW	alternative wording (where responses vary more than usual, accept other ways of expressing the same idea)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by the candidate (grammatical variants excepted)
MAX	indicates the maximum number of marks that can be awarded
+	statements on both sides of the **+** are needed for that mark
OR	separates two different routes to a mark point and only one should be awarded
ECF	error carried forward (credit an operation from a previous incorrect response)

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Question	Answer	Marks
1(a)(i)	1 four correct concentrations (80, 60, 40, 20) ; 2 correct volumes of **P** and **W** for each concentration ; **ecf**	**2**
1(a)(ii)	1 heading for independent variable: percentage concentration of protease (before heading for dependent variable) and no units in body of table ; 2 heading for dependent variable: time / seconds and no units in body of table ; 3 records two times for each concentration ; 4 time for clotting recorded for the highest concentration of protease is shorter than for the lowest concentration of protease; 5 records time in whole seconds ;	**5**
1(a)(iii)	difficult to judge when clots first appear ;	**1**
1(a)(iv)	to improve the accuracy of the results ;	**1**
1(a)(v)	1 (cm^3) ;	**1**
1(a)(vi)	records a time for **U** longer than the time recorded for 100% and seconds ;	**1**
1(a)(vii)	correct estimate for **U** based on candidate's results ;	**1**
1(a)(viii)	1 use more concentrations with narrower intervals ; 2 states concentrations both sides of the estimate ;	**2**
1(b)(i)	1 label on *x*-axis: pH and label on *y*-axis: protease activity / $\mu mol\ min^{-1}\ mg^{-1}$; 2 scale on *x*-axis: 2 pH units to 2 cm and labelled at least each 2cm and scale on *y*-axis: 5 $\mu mol\ min^{-1}\ mg^{-1}$ to 2 cm and labelled at least each 2 cm ; 3 correct plotting of all six points using small crosses or dots in circles ; 4 six plots joined with a thin line passing through all points ;	**4**

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Question	Answer	Marks
1(b)(ii)	*any **three** from:* 1 optimum pH around 6.1 ; 2 (away from optimum) shape of the active site is changed ; 3 (from pH1.8 to pH6.1) more enzyme substrate complexes/(from pH6.1 to pH8.5) less enzyme substrate complexes / (at optimum pH) maximum number of enzyme substrate complexes ; 4 low activity at extreme pH ;	**3**

Question	Answer	Marks
2(a)(i)	1 uses most of the available space and no shading ; 2 correct section of the leaf drawn and no cells drawn ; 3 draws the correct number of tissues and trichomes ; 4 draws one vascular bundle in each fold ; 5 label line and label to vascular bundle ;	**5**
2(a)(ii)	1 suitable size and all lines sharp and continuous ; 2 draws only three whole cells and one trichome and each cell touches at least one other cell ; 3 two lines around each cell and three lines where cells touch ; 4 draws correct shape of trichome ; 5 label line and label to the cell wall of the trichome;	**5**
2(a)(iii)	*any **one** from:* 1 rolled leaf ; 2 thick epidermis ; 3 cuticle ; 4 sunken stomata ; 5 hinge cells ;	**1**
2(b)(i)	1 correct measurement of the width of the paired guard cells (**P**–**Q**) and units ; 2 correct measurement of the width of the stoma (**R**–**S**) and units ; 3 shows the width of the stoma divided by the width of the paired guard cells and multiplied by 100 ; 4 answer to two significant figures ;	**4**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)(ii)</td><td>records only observable differences ;
three correct differences ;;;

e.g.
<table>
<tr><th>feature</th><th>Fig. 2.4</th><th>Fig. 2.5</th></tr>
<tr><td>number of stomata</td><td>less</td><td>more</td></tr>
<tr><td>shape of stomata</td><td>oval</td><td>round</td></tr>
<tr><td>nucleus in guard cell</td><td>visible</td><td>not visible</td></tr>
<tr><td>size of epidermal cells</td><td>large(r)</td><td>small(er)</td></tr>
</table></td><td>4</td></tr>
</table>

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