Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/33**

Paper 3 Advanced Practical Skills 1 **March 2020**

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 March 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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 descriptors 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.

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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.

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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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

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Question	Answer	Marks
1(a)(i)	assesses the risk of using **H** as medium or high and reason e.g. **H** is an irritant **;**	**1**
1(a)(ii)	states room temperature and at least three more temperatures between room temperature and 70 °C **;**	**1**
1(a)(iii)	1 states number of drops **;** 2 reference to time **;**	**2**
1(a)(iv)	1 *heading for independent variable*: temperature / °C and before heading for dependent variable and no units in the body of table **;** 2 *heading for dependent variable*: number of drops and reference to time **;** 3 readings for all temperatures **;** 4 *correct trend:* highest number of drops for the highest temperature **;** 5 results recorded as whole drops **;**	**5**
1(a)(v)	1 at least four stated concentrations other than 5% **;** 2 proportional or serial dilution correctly described **;**	**2**
1(a)(vi)	*any **one** from :* 1 pH and use of buffer **;** 2 volume of hydrogen peroxide and use of appropriate apparatus for measuring volume **;** 3 temperature and use of thermostatically controlled water-bath **;**	**1**
1(b)(i)	1 *x*-axis: pH and *y*-axis: enzyme activity / arbitrary units **;** 2 scale on *x*-axis: 1 to 2 cm or 2 to 2 cm, labelled at least every 2 cm and scale on *y*-axis: 5 arbitrary units to 2 cm, labelled at least every 2 cm **;** 3 correct plotting of all points using small crosses or dots in circles **;** 4 points joined with thin line passing through all points as either a smooth curve or straight lines joining each point to the next **;**	**4**

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Question	Answer	Marks
1(b)(ii)	1 shows on the graph how value estimated ; 2 correct pH stated from candidate's graph ;	2
1(b)(iii)	as pH increases the rate of enzyme activity increases and then decreases ;	1
1(b)(iv)	*any **three** from:* 1 *(from pH 3.2 to pH 5.7)* more enzyme–substrate complexes or *(from pH 5.7 to pH 7.5)* fewer enzyme–substrate complexes ; 2 *(from pH 3.2 to pH 5.7)* more successful collisions or more substrate can bind to active site or *(from pH 5.7 to pH 7.5)* fewer successful collisions or less substrate can bind to active site ; 3 reference to, ionic / hydrogen bonds and active site changes shape ; 4 enzyme becomes denatured ;	3

Question	Answer	Marks
2(a)(i)	1 suitable size and lines continuous, thin and sharp ; 2 draws only four starch grains ; 3 shows details of surface markings ; 4 draws single line around each grain ;	4
2(a)(ii)	**L** ;	1
2(a)(iii)	1 measures and records the length of three starch grains using the lines **N1, N2** and **N3** and units ; 2 shows the addition of these three lengths and shows division by three ;	2
2(a)(iv)	1 correct actual length of **N1** = 64 μm ; $4 \times 16\,\mu m$ 2 uses answer to **(a)(iii)** and shows how to calculate mean actual length of the three starch grains ; (64 ÷ image length of **N1**) × mean image length from **(a)(iii)**	2

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(b)</td><td>1 suitable size <u>and</u> whole root drawn ;
2 draws at least three layers of tissue ;
3 shows correct proportion of the stele to the diameter of the root ;
4 vascular tissue subdivided ;
5 label line and label G to the cortex ;</td><td>5</td></tr>
<tr><td>2(c)(i)</td><td>1 organises comparison into table with three columns with first column for feature <u>and</u> records only differences
or
organises comparison into table with two columns with direct comparison of the same feature in each row <u>and</u> records only differences ;

2, 3 and 4
three correct differences ; ; ; e.g.

<table>
<tr><th>feature</th><th>Fig. 2.4</th><th>Fig. 2.5</th></tr>
<tr><td>amount of vascular tissue</td><td>large(r) amount of vascular tissue</td><td>small(er) amount of vascular tissue</td></tr>
<tr><td>cortex size</td><td>small(er) cortex</td><td>large(r) cortex</td></tr>
<tr><td>starch grains</td><td>starch grains present</td><td>starch grains absent</td></tr>
<tr><td>number of layers</td><td>many / more</td><td>few / fewer</td></tr>
<tr><td>shape of cortex cells</td><td>rectangular / longer / flatter / elongated cells</td><td>circular / round / oval</td></tr>
<tr><td colspan="3">AVP</td></tr>
<tr><td colspan="3">AVP</td></tr>
</table>
</td><td>4</td></tr>
</table>

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