



## Cambridge International AS & A Level

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**BIOLOGY**

**9700/33**

Paper 3 (Advanced Practical Skills 1)

**May/June 2023**

MARK SCHEME

Maximum Mark: 40

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**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 2023 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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This document consists of **8** printed pages.

**PUBLISHED****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.

**PUBLISHED****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 | <p><u>'List rule' guidance</u></p> <p>For questions that require <i>n</i> responses (e.g. State <b>two</b> reasons ...):</p> <ul style="list-style-type: none"><li>• The response should be read as continuous prose, even when numbered answer spaces are provided.</li><li>• Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>.</li><li>• Incorrect responses should not be awarded credit but will still count towards <i>n</i>.</li><li>• Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should <b>not</b> 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.</li><li>• Non-contradictory responses after the first <i>n</i> responses may be ignored even if they include incorrect science.</li></ul> |

**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.

**PUBLISHED****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

| Question   | Answer   | Marks    |             |  |                      |                                    |                                      |          |
|--|--|----------|-------------|--|----------------------|------------------------------------|--------------------------------------|----------|
| 1(a)(i)  | 1 at least 3 additional concentrations ;<br>2 volumes of <b>M and W</b> add up to 10 ;   | <b>2</b> |             |  |                      |                                    |                                      |          |
| 1(a)(ii)   | 1 heading for percentage concentration of milk ;<br>2 heading for time and seconds ;<br>3 records result for each concentration prepared ;<br>4 records at least two results for each concentration prepared ;<br>5 results recorded as whole seconds ;  | <b>5</b> |             |  |                      |                                    |                                      |          |
| 1(a)(iii)  | describes the trend correctly ;  | <b>1</b> |             |  |                      |                                    |                                      |          |
| 1(a)(iv)   | medium risk <b>and</b> copper sulfate is an irritant ;   | <b>1</b> |             |  |                      |                                    |                                      |          |
| 1(a)(v)  | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="752 679 1108 743">error</th> <th data-bbox="1108 679 1523 743">improvement</th> </tr> </thead> <tbody> <tr> <td data-bbox="752 743 1108 839">drops sometimes stick to the side of test-tube ;</td> <td data-bbox="1108 743 1523 839">use a wider vessel ;</td> </tr> <tr> <td data-bbox="752 839 1108 943">drops of milk remain in the milk ;</td> <td data-bbox="1108 839 1523 943">use fresh copper sulfate each time ;</td> </tr> </tbody> </table> | error    | improvement | drops sometimes stick to the side of test-tube ; | use a wider vessel ; | drops of milk remain in the milk ; | use fresh copper sulfate each time ; | <b>4</b> |
| error  | improvement  |          |             |  |                      |                                    |                                      |          |
| drops sometimes stick to the side of test-tube ; | use a wider vessel ;   |          |             |  |                      |                                    |                                      |          |
| drops of milk remain in the milk ;               | use fresh copper sulfate each time ;   |          |             |  |                      |                                    |                                      |          |
| 1(b)(i)  | 1 x-axis: temperature / °C and y-axis density of milk / arbitrary units ;<br>2 x-axis: scale 5 to 2 cm, labelled at least every 2 cm<br><b>and</b><br>y-axis: scale 4 or 5 to 2 cm, labelled at least every 2 cm, 20 at origin ;<br>3 correct plotting of 6 points ;<br>4 6 plots joined with thin line passing through all points, line is either a smooth curve or joined point to point with a straight line ;  | <b>4</b> |             |  |                      |                                    |                                      |          |
| 1(b)(ii)   | correct answer for the density of milk at 23 °C ;  | <b>1</b> |             |  |                      |                                    |                                      |          |
| 1(b)(iii)  | 1 between 10 °C and 20 °C the density of milk decreases by 2au (supports hypothesis) ;<br>2 between 20 °C and 30 °C the density of milk does not decrease by 2au (does not support hypothesis) ;   | <b>2</b> |             |  |                      |                                    |                                      |          |

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| Question           | Answer  | Marks     |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
|--------------------|---|-----------|----|----------|---------------|----------|-----------|-----------|---------|----------|--------------------|--------|-----------|---------|--------|-----------|----------|
| 2(a)(i)            | 1 uses most of the available space <b>and</b> draws minimum number of tissues ;<br>2 draws the whole root <b>and</b> no cells ;<br>3 shows two lines around stele ;<br>4 shows subdivision of stele ;<br>5 label line and label to the cortex ;   | <b>5</b>  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| 2(a)(ii)           | 1 uses most of the available space <b>and</b> lines continuous, thin and sharp ;<br>2 each xylem vessel element touching at least two other vessel elements ;<br>3 draws one large xylem vessel element and three smaller vessel elements ;<br>4 two lines around each cell ;<br>5 label line and label to the cell wall ;  | <b>5</b>  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| 2(a)(iii)          | thick walls <b>or</b> large lumen ;   | <b>1</b>  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| 2(b)(i)            | uses only observable differences ;<br><br>any <b>three from</b> :<br><br><table border="1" data-bbox="562 818 1709 1145"> <thead> <tr> <th data-bbox="562 818 922 882">feature</th> <th data-bbox="922 818 1337 882">L1</th> <th data-bbox="1337 818 1709 882">Fig. 2.1</th> </tr> </thead> <tbody> <tr> <td data-bbox="562 882 922 951">overall shape</td> <td data-bbox="922 882 1337 951">circular</td> <td data-bbox="1337 882 1709 951">angular ;</td> </tr> <tr> <td data-bbox="562 951 922 1019">trichomes</td> <td data-bbox="922 951 1337 1019">present</td> <td data-bbox="1337 951 1709 1019">absent ;</td> </tr> <tr> <td data-bbox="562 1019 922 1088">palisade mesophyll</td> <td data-bbox="922 1019 1337 1088">absent</td> <td data-bbox="1337 1019 1709 1088">present ;</td> </tr> <tr> <td data-bbox="562 1088 922 1145">stomata</td> <td data-bbox="922 1088 1337 1145">absent</td> <td data-bbox="1337 1088 1709 1145">present ;</td> </tr> </tbody> </table> | feature   | L1 | Fig. 2.1 | overall shape | circular | angular ; | trichomes | present | absent ; | palisade mesophyll | absent | present ; | stomata | absent | present ; | <b>4</b> |
| feature            | L1  | Fig. 2.1  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| overall shape      | circular  | angular ; |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| trichomes          | present   | absent ;  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| palisade mesophyll | absent  | present ; |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| stomata            | absent  | present ; |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| 2(b)(ii)           | vascular bundle in centre ;   | <b>1</b>  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |
| 2(c)               | 1 correct measurement of scale bar <b>and</b> line P – Q ;<br>2 shows length of scale bar divided by 150 ;<br>3 shows length of line P – Q divided by answer to mp 2 ;<br>4 correct answer <b>and</b> appropriate units ;   | <b>4</b>  |    |          |               |          |           |           |         |          |                    |        |           |         |        |           |          |