CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **May/June 2024**

MARK SCHEME

Maximum Mark: 30

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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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 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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Mark scheme abbreviations

;	separates marking points
/	alternative answers for the same point
A	accept (for answers correctly cued by the question, or by extra guidance)
R	reject
I	ignore
( )	the word / phrase in brackets is not required, but sets the context
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
AVP	alternative valid point

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Question	Answer	Marks
1(a)(i)	species of tree **or** type of tree **;**	**1**
1(a)(ii)	*any **two** from:* 1 (same) number of / 3, plantations for each tree species **;** 2 (same) size/area of, plot/(sampling)area / 36 m x 36 m / 1296m^2 **;** 3 (same / used a) belt transect (same method in all plots/plantations) **;** 4 (same) months / seasons (of the year) **or** sampling at the same times **;**	**2**

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Question	Answer	Marks
1(b)	*any **five** from:* *using a belt transect:* 1 use of tape / line / string, and quadrat (to create belt transect) **;** 2 selecting a start point for the, transect / placement of tape / line / string **or** all transects same length, in plots / plantations / repeats **;** 3 same (size) quadrat **;** 4 sample at / use quadrat at, regular intervals / stated distances along the, tape / line / string / transect **or** continuous belt transect **;** *collecting data:* 5 method to identify each of the plant (species in the quadrat) **;** 6 count / record / note the number **of** (individuals), each plant species (n) (in each quadrat / at each sampling point) **or** estimate percentage (%) cover of each plant species (in each quadrat) **;** 7 use at least 3 different transects (in each plot) **;** 8 named hazard and risk and precaution **;** e.g. (see table below)	**5**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(b)</td><td>
<table>
<tr><th>hazard</th><th>risk</th><th>precaution</th></tr>
<tr><td rowspan="3">plants / fungi</td><td>falling trees / branches</td><td>hard hat</td></tr>
<tr><td>thorns</td><td>gloves / goggles / mask / long trousers / PPE</td></tr>
<tr><td>irritant / allergy
infection (spores)</td><td>antihistamines / cover skin / first aid equipment</td></tr>
<tr><td>(named)
animal(s)
parasite</td><td>bites / infection / attack / stings / allergy</td><td>antivenom / antihistamine / trained, professionals / medics, available / insect
repellent / gloves / goggles / mask / PPE / cover skin</td></tr>
<tr><td rowspan="2">plantation
terrain</td><td>trip hazard</td><td>correct footwear / watch where you are walking / use walking sticks</td></tr>
<tr><td>getting lost</td><td>work in group / maps / use GPS / guide</td></tr>
<tr><td>poachers</td><td>being attacked / shot</td><td>trained, professionals/ medics, available</td></tr>
</table>
</td><td></td></tr>
<tr><td>1(c)</td><td>any one from:

(does not support)
1. acacia and mango have the same means
or
acacia and mango have similar, D values / index
or
mango and invasive species have overlapping, D values / index / means +/- SD ;

(does support / partially support)
2. sal tree has the highest, D value / index / mean
or
sal tree has greater, D values / Index / mean, than both alien species ;</td><td>1</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(d)(i)</td><td>
<table>
<tr><td>concentration / mg cm^{-3}</td><td>volume of stock solution / cm^3</td><td>volume of (distilled) water / cm^3</td></tr>
<tr><td>7.5</td><td>37.5</td><td>12.5 ;</td></tr>
<tr><td>2.5</td><td>12.5</td><td>37.5 ;</td></tr>
</table>
</td><td>2</td></tr>
<tr><td>1(d)(ii)</td><td>1 correct processes <u>and</u> correct figures ;

2 (correct) answer to 3 significant figures ; ecf if mp1 is incorrect

3 decrease / minus (number) ;</td><td>3</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(e)</td><td>

*any **three** from:*

<table>
<tr><th></th><th>improvement</th><th>impact</th></tr>
<tr><td>1</td><td>More, intermediate / smaller values / intervals
appropriate examples accepted</td><td>better idea of the, trend / pattern / effect ;</td></tr>
<tr><td>2</td><td>exclude anomalous results</td><td>improve reliability ;</td></tr>
<tr><td>3</td><td>repeat reading for 2.5 / 5.0 / 7.5 mg cm^{-3} (any of these 3 might be anomalous)</td><td>check the anomaly / improve reliability ;</td></tr>
<tr><td>4</td><td>repeat investigation at least twice
or
repeat with more marigolds</td><td>better idea of trend / improve reliability /
reduce effect of anomalies ;</td></tr>
<tr><td>5</td><td>(calculate) standard error / standard deviation / confidence intervals / statistical analysis</td><td>check for significance (difference between the means) / checking accuracy ;</td></tr>
<tr><td>6</td><td>use marigold clones</td><td>exclude genetic effects / improve validity ;</td></tr>
<tr><td>7</td><td>use Vernier calliper</td><td>more precise measurements ;</td></tr>
<tr><td>8</td><td>measure the mass of all the roots</td><td>improve reliability ;</td></tr>
</table>

</td><td>3</td></tr>
<tr><td>1(f)</td><td>

*any **two** from:*

1 (same) mass of soil ;

2 sample from same depth ;

3 sampled at the same time ;

4 sample from same, distance from roots / position in the pot ;

</td><td>2</td></tr>
</table>

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Question	Answer	Marks
2(a)	1 correct counting / correct number of divisions / 28 ± 2 **;** 2 for correct conversion(s) to micrometres **;** 3 correct answer / 8.96 / 8.32–9.6 **;**	**3**
2(b)(i)	measure the, widest / narrowest / longest, part of the each nucleus **;**	**1**
2(b)(ii)	*any **one** from:* 1 (same) magnification / × 400 **;** 2 (same) number of / 100 nuclei (measuring) per, person **;** 3 (sample from / same) thyroid / gland **;** 4 same / one, scientist (measuring the diameter) **;** *5 idea that*: type of tumour cell is unknown **;**	**1**
2(b)(iii)	there is no difference, in / between the (mean) nuclear diameters of, the Pap-stained cells and H&E- stained cells **;**	**1**
2(b)(iv)	accept null hypothesis **or** there is no significant difference **;**	**1**
2(b)(v)	*state* 1 *idea that* this technique can be used to distinguish between benign and malignant cells **or** the mean nuclear diameter of benign cells is smaller than in malignant cells / **ora** **;** *explain* 2 mean ± 2 SE, do not overlap **or** there is a significant difference in the mean nuclear diameters of benign cells and malignant cells **;**	**2**

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Question	Answer	Marks
2(b)(vi)	*disadvantages* • time consuming (prepping / counting / measuring) • labour intensive • shortage of skilled scientists • invasive • only thyroid / one tissue, used • human error – due to, small values / very close values / large numbers counted *impact:* • infection / bleeding • pain • tissue damage • metastasis • anxiety • delayed treatment • unnecessary treatment • idea of misdiagnosis • possibly not feasible on large scale • may not be true of other tumours	**2**

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