CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/51**

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.

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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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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)(i)</td><td>wind speed ;</td><td>1</td></tr>
<tr><td>1(a)(ii)</td><td>any six from:
1 method to use fan(s), to obtain a minimum of five different wind speeds ;
2 ref. to standardised variable for using the fan ;
3 use a method to maintain, same / stated, temperature ;
4 use a method to maintain, same / stated, light intensity ;
5 at each wind speed, measure / note / record / AW, the initial mass <u>and</u> final mass, in a fixed time ;
6 idea of equilibration / acclimatisation, of, plant / Japanese spiraea / apparatus ;
7 use at least three measurements for each wind speed <u>and</u> calculate a mean ;
8 safety comment with hazard <u>and</u> precaution ;
<table>
<tr><th>hazard</th><th>risk</th><th>precaution</th></tr>
<tr><td>Japanese spiraea / plant</td><td>irritant / allergy</td><td>gloves / mask / PPE</td></tr>
<tr><td>soil</td><td>biohazard / pathogens / allergy
I irritant</td><td>gloves / mask / PPE</td></tr>
<tr><td>fan</td><td>hair / clothing / AW, trapped in fan</td><td>method to, control loose,
hair / clothing / AW</td></tr>
</table>
9 method for measuring wind speed ;
10 idea of replacing water lost from plant (before each new measurement) ;</td><td>6</td></tr>
</table>

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Question	Answer	Marks
1(a)(iii)	as wind speed, increases: rate of transpiration - increases **or** decrease in mass, in fixed / stated time - increases **or** rate of decrease in mass - increases **or** time taken, for a fixed decrease in mass - decreases **; ora**	**1**
1(b)(i)	263 **;**	**1**
1(b)(ii)	*any **one** from:* 1 use, same / stated, size of (blue) cobalt chloride paper **;** 2 *idea of* use a (pink) colour standard (to determine end point) **;** 3 *idea of* measure different positions on (lower) surface of leaf **;** 4 *idea of* unbiased selection of, leaves / leaf position **;**	**1**

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Question	Answer	Marks
2(a)	*any **three** from:* 1 light intensity **;** 2 duration / hours / AW, of light **;** 3 volume, of water (added to soil) **;** 4 type / pH, of soil **;** 5 mineral (ion), concentration (in soil) **;** 6 humidity **;** 7 carbon dioxide concentration **;**	**3**
2(b)	(high mean temperature leads to) lower / AW (mean stomatal conductance), in both isohydric and anisohydric (species) **;** **ora**	**1**

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Question	Answer	Marks
2(c)	*any **four** from:* *conclusion:* 1 (water stress leads to) lower / AW, (mean stomatal) conductance in isohydric and anisohydric (species) **; ora** *explanation:* 2 *idea that* (lower stomatal conductance when exposed to water stress indicates that) water loss (by transpiration) is reduced **;** *conclusion:* 3 isohydric (species exposed to water stress and a high temperature) increase (mean stomatal) conductance **or** increased (mean stomatal) conductance for isohydric (species exposed to water stress and a high temperature) is (statistically) significant **;** *explanation:* 4 *idea that* (increased mean stomatal conductance in isohydric species exposed to water stress and a high temperature) has a cooling effect **;** *conclusion:* 5 anisohydric (species exposed to water stress and a high temperature) do not change (mean stomatal) conductance **or** change / difference / decrease / AW, in (mean stomatal) conductance for anisohydric (species exposed to water stress and a high temperature) is not (statistically) significant **;** *explanation:* 6 *idea that* (unchanged mean stomatal conductance in anisohydric species when exposed to water stress and a high temperature) to allow carbon dioxide uptake (for photosynthesis) **;** *conclusion:* 7 paired data quote to support conclusion **;**	**4**

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Question	Answer	Marks
2(d)(i)	*idea that* there is no difference between the (mean) percentage of leaves that were dead on (young trees from) isohydric species and (young trees from) anisohydric species **;**	**1**
2(d)(ii)	1883 **;** t = (190 – 35) / 8231 **;**	**2**
2(d)(iii)	1 calculated value of, t / 1883, is less than, 2011 / critical value (at p = 0.05) **or** calculated value of, t / 1883, is less than, 2682 / critical value (at p = 0.01) **; ora** 2 null hypothesis is accepted (at p = 0.05 / p = 0.01) **;** 3 there is no significant difference (at p = 0.05 / p = 0.01) **;**	**3**

Question	Answer	Marks
3(a)(i)	(human volunteer / person and) no (mosquito) repellent / spray **or** (human volunteer / person and) water (spray) **;** **or** (human volunteer / person and) solvent (from repellent / spray) **;**	**1**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)(ii)</td><td>named risk <u>and</u> matching precaution ;
<table>
<tr><th>risk</th><th>precaution</th></tr>
<tr><td>mosquitoes take blood meal (from scientist)
or
mosquitoes bite (scientist)</td><td>protective clothing / gloves / masks / PPE</td></tr>
<tr><td>mosquitoes transmit, disease / pathogen / yellow fever / AW</td><td>protective clothing / gloves / masks / PPE
use, disease / pathogen, free mosquitoes
vaccine (against yellow fever)</td></tr>
<tr><td>(mosquito) repellent / spray / solvent,
allergy / irritant / toxic</td><td>protective clothing / gloves / masks / PPE</td></tr>
</table></td><td>1</td></tr>
</table>

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Question	Answer	Marks
3(b)	*any **four** from:* 1 98% DEET is effective (at repelling mosquitoes) **;** 2 *idea that* standard error / SE, overlap for 98% DEET and lemon eucalyptus oil, so these mosquito repellents are equally effective / no significant difference between these mosquito repellents **;** 3 *idea that* lemon eucalyptus oil is, (slightly) more effective / equally effective (as 98% DEET), but, has a low concentration (of chemical) / might be safer **or** *idea that* lemon eucalyptus oil is, (slightly) more effective / equally effective, (as 98% DEET) but DEET is, toxic / irritant / harmful **;** 4 *idea that* not true for all concentrations of DEET / 40% (concentration) DEET is much less effective **; ora** 5 no statistical test carried out **;** 6 only one human volunteer tested **;** 7 *idea that* some mosquitoes are still attracted to the human volunteer (when using 98% DEET) **;** 8 *idea that* mosquitoes used / *Aedes aegypti*, do not transmit malaria **;** 9 *idea that* mosquitoes were not able to, take a blood meal from / bite, the human volunteer / investigation only measured attraction of mosquitoes (to the human volunteer) **;**	**4**

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