Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/51**

Paper 5 Planning, Analysis and Evaluation **October/November 2019**

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 October/November 2019 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:

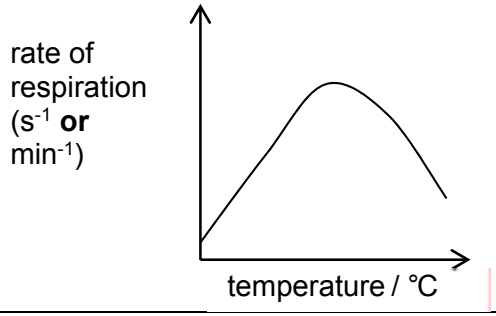
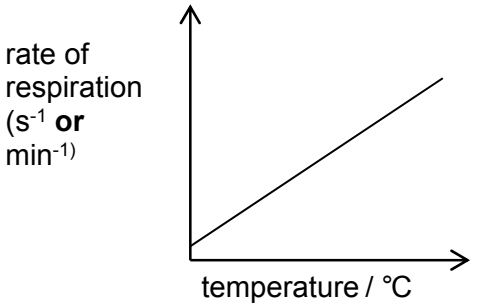
Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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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.

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Question	Answer	Marks
1(a)(i)	as temperature increases, the carbon dioxide increases / increases and then decreases/levels off / AW **;**	**1**
1(a)(ii)	*independent variable:* temperature **;** *dependent variable:* colour / pH **;**	**2**
1(a)(iii)	any 7 of: **1** *ref. to* setting up at least 5 water-baths at different temperatures **;** **2** *ref. to* a suitable range of temperatures with units **;** **3** same / stated / known, volume / concentration of hydrogencarbonate / indicator (solution) to each test-tube **;** **4** *ref. to* adding oxygen into indicator solution **;** **5** *ref. to* indicator starting at same colour or pH in all test-tubes **;** **6** *ref to* foil, mix, (immediately) start timing / mix, (immediately) foil, (immediately) start timing **;** **7** use same / stated / known, volume of *Chlorella* **;** **8** *ref. to* putting indicator and *Chlorella* in separate tubes in a water-bath to reach desired temperature / fixed time **;** **9** mix *Chlorella* and indicator and *ref. to* a specific end point to be measured **;** **10** (*ref. to* a control using), killed / boiled / dead, *Chlorella* (of same volume) **;** **11** (if time / pH) at least three replicates / repeats and finding mean (of time or pH) or identify / eliminate / remove anomalies **or** (if colour) *ref. to* using at least three replicates / repeats **;** **12** *ref. to* low risk **;**	**7**

Question	Answer	Marks
1(b)(i)	1 time (to reach standard colour / pH) **;**	**1**
1(b)(ii)	temperature on *x*-axis **;** labelled axis **and** units **;** appropriate curve for named axis **;** e.g.   	**3**
1(c)(i)	0.31 **;**	**1**
1(c)(ii)	there is no, (significant) correlation / relationship, between the cell density and the rate of carbon dioxide production **or** the correlation / relationship between cell density and the rate of carbon dioxide production is not significant **;**	**1**
1(c)(iii)	strong **;** positive correlation **;**	**2**

Question	Answer	Marks
1(c)(iv)	*any 2 of:* **1** correlation does not mean causation **;** **2** fewer than number of paired observations (recommended) for Pearson test **;** **3** no replicates / no repeats / only done experiment once **;** **4** only narrow range of cell densities **;** **5** bacteria / other microorganisms present that are respiring **;**	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>any one from:
<table>
<tr><td>tissue</td><td>reason ;</td></tr>
<tr><td>xylem</td><td rowspan="3">transports water</td></tr>
<tr><td>epidermis of root</td></tr>
<tr><td>cortex of root / parenchyma in root / endodermis</td></tr>
<tr><td>epidermis of leaf</td><td rowspan="2">(too much) water loss</td></tr>
<tr><td>mesophyll (of leaf)</td></tr>
</table></td><td>1</td></tr>
<tr><td>2(b)</td><td>it is not a 3:1 ratio (expected) ;

reason (1 of:)
due to interactions between genes ;

non resistant plants / certain allele combinations, have reduced chances of survival ;</td><td>2</td></tr>
</table>

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Question	Answer	Marks
2(c)(i)	*any 3 of:* **1** probes / known DNA sequences attached to plate / slide / AW **;** **2** *ref. to* (probe) DNA is single stranded **;** **3** mRNA from resistant **and** non-resistant plants are extracted **;** **4** mRNA converted to cDNA **;** **5** cDNA / single strand of DNA (from samples) labelled with **different** colour (fluorescent) dyes (for resistant **and** non-resistant plants) **;** **6** cDNA / single strand of DNA (from sample), allowed to hybridise with probe / added to plates / added to probes **;** **7** fluorescence identifies presence of genes **;**	**3**
2(c)(ii)	3 : 1 **;**	**1**
2(c)(iii)	67 / 66.6 **;**	**1**
2(c)(iv)	at 24 hours, genes expressed more rapidly / more genes expressed, in resistant variety **compared** to non-resistant variety / **ora** **or** at 48 hours, less genes expressed, in resistant variety **compared** to non-resistant variety / **ora ;** number of genes expressed decreases in resistant variety as time increases **;**	**2**

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