Cambridge International AS & A Level

**Cambridge Assessment International Education**
Cambridge International Advanced Subsidiary and Advanced Level

**BIOLOGY** **9700/53**

Paper 5 Planning, Analysis and Evaluation **May/June 2018**

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.

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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:<br><br>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:<br><br>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
**R** reject
**A** accept (for answers correctly cued by the question, or by extra guidance)
**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
**I** ignore
**AVP** alternative valid point

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(a) | (named) buffer **;** | **1** | |
| 1(b) | ref. to first mixing the algae with (sodium) alginate **;**<br>ref. to then adding (alginate and algae) to calcium chloride **;**<br>ref. to method of dropping mixture (to form beads) **;** | **3** | e.g. using syringe or pipette |
| 1(c)(i) | *independent variable:*<br>light intensity / distance of container from lamp **;**<br><br>*dependent variable:*<br>colour of indicator / pH **;** | **2** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(c)(ii) | *five from:*<br><br>1 method to vary light intensity **;**<br><br>2 five values of stated distances in the range 10 to 200 cm **;**<br><br>3 cover tubes with metal foil / light proof cover **;**<br><br>*critical step*<br>4 expose to light and record, colour change / pH, after fixed time **;**<br><br>5 ref. to a suitable control **;**<br><br>6 same, (stated) volume / concentration, of hydrogencarbonate solution **;**<br><br>7 same, number / mass / volume, of algal balls **;**<br><br>8 ref. to a minimum of two replicates <u>and</u> calculate a mean *or* identify / eliminate / remove anomalies **;**<br><br>9 medium risk<br>or<br>hazard <u>and</u> suitable safety precaution **;** | **5** | *ignore 'amount' for any volume or concentration*<br><br>1. e.g. distances between tube and lamp or different strengths of neutral density filters or wattages of bulbs / variable resistor / dimmer switch / number of lamps<br><br>2 if any other method used, must refer to 5 stated values e.g. wattages / etc.<br><br>3 **A** work in a dark room with only one light source<br><br>4 **A** any stated time<br>**A** time to a specific colour / pH<br><br>5 e.g. hydrogencarbonate with, glass beads / balls with no algae / balls with dead algae<br><br>9 e.g. sodium hydrogencarbonate indicator solution is harmful / irritant **and** wear gloves / goggles / mask<br>**A** allergy to, alginate / algae, **and** wear gloves / mask / goggles |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(c)(iii) | place a heat filter between the lamp and container **;** | **1** | **A** description of heat filter<br>e.g. container of water / double glazed glass sheet<br>**A** cold light source<br>e.g. LED lights |
| 1(d) | $1.6 \times 10^{-3}$ / 0.0016 / 0.002 **;** | **1** | |
| 1(e)(i) | *one from:*<br><br>judging colour alone is subjective **;**<br>different people see colours differently **;**<br>*idea that* pH probe is more sensitive **;** | **1** | **A** gives a numerical / quantitative result |
| 1(e)(ii) | curve should be to the right of original curve and must be drawn from 0 to 10 minutes **;** | **1** | |
| 1(e)(iii) | indicator solution provides, hydrogencarbonate ions / carbon dioxide **;** | **1** | |
| 1(f)(i) | there is no <u>significant</u> difference between the (mean) pH for treatment 1 and treatment 2 / no weed killer and weed killer **A ;**<br><br>or<br><br>the difference between the (mean) pH for treatment 1 and treatment 2 / no weed killer and weed killer **A** is not <u>significant</u> | **1** | |
| 1(f)(ii) | *one from:*<br><br>continuous data **;**<br>data is normally distributed **;**<br>standard deviations are approximately the same **;**<br>size of the two samples is less than 30 **;** | **1** | **I** 'compare the means' |
| 1(f)(iii) | n = 10 **;** | **1** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(f)(iv) | yes for weed killers **A** and **C** / no for weed killer **B ;**<br><br>*plus two from:*<br><br>(significant for A or C) because *p* value / probability, is less than 0.05<br>**or**<br>*p* value shows there is less than 5% chance that results are due to chance **;**<br><br>effect of weed killer **A** greater than weed killer **C** (because less than 0.001) **;**<br><br>(not significant for **B**) because *p* value greater than (0).05<br>**or**<br>*p* value shows there is less than 5% chance that results are due to weed killer **B ;** | **3** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(a) | 5000 / 5 × $10^3$ (: 1) **;** | **1** | |
| 2(b)(i) | *one from:*<br><br>length of transect **;**<br>number of sites surveyed / number of transects (each year) **;**<br>geographical area / reef, in which study carried out **;**<br>direction of, sampling / swimming / transect **;** | **1** | |
| 2(b)(ii) | *three from:*<br><br>*supports*<br>(mean log) lionfish abundance has decreased (after 2008) **;**<br><br>*does not support*<br>increase in mean abundance decreasing from 2007–2008 so could have started catching lionfish, earlier / in 2007 **;**<br>95% confidence interval bars overlap **;**<br>therefore no significant difference between means **;** | **3** | |
| 2(c) | 70 **; ; ;**<br><br>from graph:<br>95% confidence interval = 35 **;**<br><br>therefore, $S_M$ = 35 / 2 = 17.5<br>$\sqrt{n}$ = 4 **;**<br><br>rearranging equation:<br>(17.5 × 4) 70 = *s* **;** | **3** | *note: correct answer with no working = 3 marks*<br>*if incorrect answer, then check working* |