Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **February/March 2022**

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 February/March 2022 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.

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.

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 the candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

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Question	Answer	Marks
1(a)	*idea of* replace (live) water plant */ Egeria densa* with: dead / AW, water plant (of the same volume) **or** sterile / inert / glass beads / AW, material (of same volume) **or** pond water with sodium hydrogencarbonate (no water plant) **;**	**1**
1(b)(i)	*any **seven** from:* 1 use, lamp / AW, at different distances from plant **or** use, lamp / AW, with different power ratings / wattages (at same distances) **;** 2 use a minimum of five, different / stated, light intensities / AW **;** 3 use, a light meter / an app, to measure light intensity **;** 4 carry out investigation, in a darkened room / with no other light source / AW **;** 5 measure / note / record, the distance the, meniscus / AW, moves along the capillary tube / scale, in a fixed time **or** measure / note / record, the time the, meniscus / AW, takes to travel, a fixed distance on the capillary tube / scale **;** 6 use, same / stated, length of water plant / *Egeria densa* **;** 7 use, same / stated, mass / concentration, of sodium hydrogencarbonate **;** 8 use a method to reduce heating effect of lamp **;** 9 *idea of* equilibration / acclimatisation, of, water plant / *Egeria densa* / whole apparatus (to each light intensity) **;** 10 use at least three measurements (at each light intensity / AW,) **and** calculate a mean **;** 11 safety comment with hazard, risk **and** precaution **;**	**7**

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Question	Answer	Marks
1(b)(ii)	*horizontal axis labelled:* distance from light bulb / light intensity / power rating of light bulb / AW **and** *vertical axis labelled:* rate of photosynthesis / rate of movement of meniscus / distance meniscus moved (in set time) / time taken for meniscus to move (a set distance) **;** *correct units*: (distance from light bulb) cm / mm (light intensity) lux / cd (candela) / alternative units (power rating of bulb) W **and** (rate of photosynthesis) cm min^{-1} / mm min^{-1} / cm s^{-1} / mm s^{-1} (rate of movement of meniscus) cm min^{-1} / mm min^{-1} / cm s^{-1} / mm s^{-1} (distance meniscus moved) cm / mm (time for meniscus to move) min / s **;** appropriately shaped line **;** positive gradient (may level off at higher light intensities) for, light intensity / power rating of light bulb, against, rate of photosynthesis / rate of movement / distance moved negative gradient (may level off at higher light intensities) for, light intensity / power rating of light bulb against time to move set distance negative gradient (may level off at shorter distances) for distance from light bulb against, rate of photosynthesis / rate of movement / distance moved positive gradient (may level off at shorter distances) for distance from light bulb against time to move set distance	**3**
1(c)(i)	0.88 **;**	**1**

Question	Answer	Marks
1(c)(ii)	*idea of:* 1 difficulty in achieving, concentrated / not spread out / AW, spot of extract **;** 2 each pigment, spreads out during migration / gives long streak / runs into each other / overlaps / AW (so difficult to measure accurately) **;** 3 pigment may, fade / be too pale to see clearly / AW, (so difficult to measure accurately) **;** 4 uniformity / quality / grade, of (chromatography) paper **;** 5 type of solvent **;** 6 different, laboratory / ambient / AW, conditions **;**	**1**

Question	Answer	Marks
2(a)	type of woodland / presence or absence of native tree species / AW **;**	**1**
2(b)(i)	three standardised variables **;** *from:* 25 traps / same number, of traps in each area 25 traps / same number, of traps in each trapping session mass / 10 g, food (for rodents) / bait time interval / 24 hours, before checking trap four / same number of, days / sessions (for each area) month / April / season / time of year	**1**
2(b)(ii)	any suitable method of generating, random numbers / coordinates / positions **;** use the numbers generated, as coordinates / grid reference, to locate each trap site **;**	**2**

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Question	Answer	Marks
2(c)(i)	0.716 / 0.717 / 0.718 **;** **;** *if answer is incorrect,* **ALLOW** *1 mark max for:* correct answer to, two significant figures / more than three significant figures 1 – calculated $\Sigma(n/N)^2$	**2**
2(c)(ii)	*any* ***three*** *from:* *conclusions:* 1 the biodiversity / (species) diversity, in the area with a mixture of native tree species and saltcedar trees is, greater / higher / AW, than the, biodiversity / (species) diversity, in the area of only saltcedar trees **;** 2 the area with a mixture of native tree species and saltcedar trees, has more, (rodent) species / types (than the area with only saltcedar trees) / AW **;** *explanations (max* ***two****):* 3 *idea of* (diversity is lower in the area with only saltcedar trees because) fewer food sources (for rodents) **;** ora 4 saltcedar trees provide less, protection / shelter / nesting sites / niches / AW **;** ora 5 AVP **;**	**3**
2(d)(i)	both error bars correctly plotted **;**	**1**
2(d)(ii)	*any* ***two*** *from:* 1 how close, the calculated / sample, mean is (likely to be) to, the true / actual / real / AW, mean **;** 2 there is overlap in the, SE / error, bars (of the two means) **;** 3 (this indicates that) there is no (statistically) significant difference (between the two means) **;**	**2**
2(d)(iii)	*idea that:* there is no difference between the abundance of the deer mouse in, areas with only saltcedar trees and in areas with a mixture of native tree species and saltcedar trees / the two types of woodland **;**	**1**

Question	Answer	Marks
3	*any **four** from:* 1 brine soak / treatment 4, kills, 100% / all, slipper limpets **;** 2 brine soak / treatment 4 **and**, chilled conditions / 4 °C to 5 °C, kills fewer mussels (than brine soak at 12 °C to 13 °C) **;** 3 repeat brine rinse / treatment 3, **and** at 12 °C to 13 °C kills all slipper limpets and very few mussels (so could be best) **;** **or** repeat brine rinse / treatment 3, **and** at 4 °C to 5 °C kills nearly all slipper limpets and no mussels (so could be best) **;** 4 appropriate paired data quote **;** 5, 6 ref. to reason for uncertainty **; ;** e.g. only tested 30 individuals / not enough replicates no data on long-term impact no results for, small / < 30 mm / young, mussels did not test with mixture of slipper limpets and mussels *idea that* conclusion not tested statistically *idea that* there is a cost implication (for the different treatments)	**4**