Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **March 2020**

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.

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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.

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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.

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 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 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)	*independent variable:* wavelength of light / different colour filters **;** *dependent variable:* time for, methylene blue / (redox) indicator, to change colour (from blue to colourless) / decolourise / become colourless **;**	**2**
1(b)(i)	*any **ten** from:* 1 ref. to using, same / stated, mass of each type of seaweed **;** 2 ref. to, (cutting / tearing, samples into small pieces and) placing samples into a, mortar and pestle / blender, **and** grinding / blending **;** 3 use same / stated, volume of (cold) buffer for all extractions **;** 4 idea of pouring / filtering the contents of the, mortar / blender, through fine cloth (into a, beaker / tube) **;** 5 ref. to using ice to keep, chloroplasts / filtrate / extract / suspension, cold **;** 6 ref. to covering extract with metal foil (to keep in dark) **;** 7 take the, same / stated, volume of each extract suspension **;** 8 ref. to adding (drops of) methylene blue indicator to, extract / filtrate / chloroplasts, until it (just) turns blue **;** 9 idea of using coloured filters wrapped around the, tubes / syringes, (to provide particular wavelengths of light) **;** 10 place lamp at a, fixed / stated, distance **;** 11 idea of exposing to light and immediately starting timer **;** 12 ref. to timing until (methylene) blue is decolourised **or** ref. to timing until colour of sample matches, colour of sample before adding methylene blue / control / AW **;**	**10**

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Question	Answer	Marks
1(b)(i)	13 use, white tile / white card, as background to judge colour change / AW ; 14 idea that the procedure is repeated for each seaweed and for each, coloured filter / wavelength ; 15 ref. to three measurements for each procedure **and** taking a mean (time) ; 16 ref. to low risk ;	
1(b)(ii)	1 idea of (finding) rate / ref. to 1 / t (at each wavelength / colour) ; 2 plot a graph of rate (of photosynthesis / of change of colour) against wavelength, of light ;	**2**
1(c)(i)	*any two from:* 1 all the seaweeds have blue-green **and** orange pigments ; 2 only green seaweed has, yellow / green, pigment / ora ; 3 only brown seaweed has, orange-brown / pale green, pigment / ora ; 4 only red seaweed has red pigment / ora ; 5 correct comment on comparison of number of pigments between different seaweeds ; 6 ref. to comparisons of solubility between pigments ; e.g. red pigment least soluble / orange pigment most soluble ;	**2**

Question	Answer	Marks
1(c)(ii)	*against (max 1):* 1 green seaweeds have pigments that absorb light at short wavelengths (an adaptation for living at greater depths) / ora **;** 2 lack of data on relative size of peak absorbance for each pigment **;** 3 *idea that* all seaweeds have a range of pigments absorbing at different wavelengths which means this alone cannot adapt them to a specific depth **;** *for (max 1):* 4 red and brown seaweeds lack the green pigment that absorbs at longer wavelengths (which would not reach the depths at which they grow) **;** 5 red seaweeds have red pigment / brown seaweeds have orange-brown pigment, that absorb at short wavelengths of light (that reach them) **;**	**2**

Question	Answer	Marks
2(a)(i)	*any **three** from:* 1 idea of the number of cases (per 100 000) increases with age **;** 2 the number of men (per 100 000) with Parkinson's disease is higher than women / higher proportion of men than women develop Parkinson's disease / ora **;** 3 greatest increase in cases occurs between 60–69 and 70–79 age group **;** 4 number of cases in men increases at all ages **or** in women number of cases decreases at ages above 79 years **;** 5 no, cases / symptoms, in under 30-year olds **or** cases / symptoms, start at 30 and above **;**	**3**

Question	Answer	Marks
2(a)(ii)	*any **one** from:* data can be ranked ; at least five pairs of data ; graph suggests there is an increasing relationship ;	**1**
2(a)(iii)	there is no correlation between age and the number of cases (per 100 000) of Parkinson's disease ;	**1**
2(b)(i)	*any **two** from:* 1 number of rats in each group / 12 rats per group ; 2 sex of rats / all male rats ; 3 volume of saline given / 4 cm^3 saline given ; 4 time at which saline / treatment / injection / medication / AW, given ; **or** saline / treatment / injection / medication / AW, given at, same / stated, times ; 5 mass of rats / all rats within $\pm$ 20 g ; 6 health of rats / all rats, healthy ;	**2**

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Question	Answer	Marks
2(b)(ii)	*any **one** from:* age of rats ; number of NSC per injection / AW ; type of, food / nutrient ; mass of, food / nutrient ; time of feeding ; same, type / size, of cage ; type / species, of rat ; environmental temperature ; idea of stress / movement ; volume of water ; concentration of saline ; type / volume / mass / dose, of chemicals to induce Parkinson's disease ;	**1**

Question	Answer	Marks
2(c)	*any **two** from:* 1 shows the spread of data (about the mean) **;** 2 allows, calculation / determination, of standard error / confidence intervals **;** 3 allows determination of whether or not there is a significant difference (between mean values) **or** allows, *t*-test to be calculated / statistical test (of significant differences between means) **;** 4 to plot error bars on, graphs / bar charts **;**	**2**
2(d)	*supports conclusion:* 1 the concentration of dopamine is (significantly) higher in the, NSC and Chinese herbal drug group / group 4, than in the, NSC only group / group 3 **;** *suggests not valid (max 1):* 2 only, a small number of rats / 12, rats in each test group **;** 3 increased dopamine production may not be correlated with more differentiation of NSCs **;** 4 study only for 28 days **;** 5 idea of at 28 days dopamine levels in treatment 4 have dropped **;** 6 at 14 days group 3 and 4, differences may not be significant / standard deviations overlap / share an overlap at 57.4 **;** 7 no control for Chinese herbal drug in Parkinson's disease rats without NSC **;** 8 only male rats **;**	**2**

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