Cambridge International AS & A Level

BIOLOGY **9700/51**

Paper 5 Planning, Analysis and Evaluation **May/June 2020**

MARK SCHEME

Maximum Mark: 30

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & 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.

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.

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

Question	Answer	Marks
1(a)	*idea of:* mix (equal volumes of), *Chlorella* / suspension, and sodium alginate **;** (slowly) drip mixture into calcium chloride (solution) **;** using a, syringe / pipette **;**	**3**
1(b)(i)	*independent variable*: temperature **;** *dependent variable*: distance travelled by the coloured liquid **;**	**2**
1(b)(ii)	*any 2 from:* *idea that* 1 (suitable because) these are temperatures at which, enzymes are expected to be functioning / *Chlorella* may survive **;** 2 (suitable because) gives enough range for at least five temperatures **;** 3 (not suitable because) does not show effect of very, high / low, temperatures **;**	**2**

Question	Answer	Marks
1(b)(iii)	*allow in context of using the same respirometer for each temperature, or separate respirometers set up in the same way for each temperature* *any 7 from*: 1 *idea of* adding a fixed volume of water to respirometer ; 2 *idea of* adding, fixed number / same mass, of immobilised algal balls (to the water below the shelf with CO_2 absorbent) ; 3 *idea of* attaching the tap, capillary tubing and scale so that they are airtight ; 4 *idea of* opening the tap (using syringe) to add air ; 5 *idea of* dipping capillary tube into liquid / setting position of liquid (using syringe) ; 6 *idea of* covering respirometer tube (containing *Chlorella*) with, metal foil / light proof material ; **A** carry out in a dark room 7 *idea of* placing respirometer tube into a water-bath at a known temperature ; 8 *idea of* opening tap and leaving to equilibrate ; 9 *idea of* closing the tap and marking position of liquid ; 10 *idea of* measuring movement of liquid along the scale for 5 minutes ; 11 *idea of* doing minimum of three measurements (in sequence) and taking a mean ; 12 *idea of* repeating experiment at each temperature, e.g. 20 °C, 30 °C, 40 °C and 50 °C ; **A** temperatures within the range of 10°C to 50°C 13 low risk experiment *or* medium risk experiment due to (named) CO_2 absorbent harmful and wear gloves ; 14 AVP ;	**7**
1(c)(i)	*idea of:* find radius of tubing in mm and use πr^2 (to find area) ; multiply by distance moved in mm ; **A** in terms of a formula	**2**

Question	Answer	Marks
1(c)(ii)	*any 2 from:* 1 *idea that* oxygen uptake increases as temperature increases and because enzymes, gain more kinetic energy / collide more frequently / form more enzyme-substrate complexes ; 2 *idea that* increases faster up to 30°C and then slows down and because, optimum temperature exceeded / other factors become limiting ; **A** doubles every 10°C increase up to 30°C then slows / Q_{10} plus explanation 3 AVP ; e.g. *idea that* increase in metabolic rate is due to increasing enzyme activity	**2**
2(a)(i)	*any 2 from:* 1 *idea of* randomising the planting of the different types of cotton plants ; 2 *idea of* large number of samples examined ; 3 AVP ;	**2**
2(a)(ii)	*any 2 from:* 1 (ambient) temperature ; 2 (sun)light (availability) ; 3 rainfall / soil water ; **A** availability of water 4 humidity ; 5 wind ; 6 (variation in) soil pH ; 7 other soil feature e.g. drainage / fertility / nutrients already present / aeration / type of soil ; 8 pests other than that, bollworm / disease ; 9 AVP ;	**2**
2(b)(i)	*any 1 from:* 1 to show the closeness of the mean to the, true / population, mean ; 2 for drawing error bars on graph(s) ;	**1**

Question	Answer	Marks
2(b)(ii)	*any 2 from:* 1 compares the means of two sets of data (for each year) ; 2 the data is continuous ; 3 data is normally distributed ;	**2**
2(b)(iii)	*any 3 from:* 1 egg density in Bt cotton and non-Bt cotton decreases (from approx 800 per plant to approx 200) ; 2 egg density increases from 2004 ; 3 larvae density on Bt cotton, fluctuates / shows little change ; 4 larvae density on non-Bt cotton decreases ; 5 AVP ;	**3**
2(c)(i)	*any 1 from:* 1 time when sampling is carried out / *idea that* sampling occurs during breeding season / AW ; 2 area of each field sampled ; 3 number of fields sampled ; 4 AVP ; e.g. training / experience, of those doing the sampling	**1**
2(c)(ii)	*idea that* the use of Bt cotton kills larvae so (each year) fewer survive to become adults and lay eggs on crops other than cotton / AW ;	**1**