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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **May/June 2026**

MARK SCHEME

Maximum Mark: 30

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **17** printed pages.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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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.

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Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	correct point or mark awarded
	correct awarding one mark from marking point or marking group 1. similar numbered ticks are used for marking point or marking groups 2, 3, 4 etc.
	incorrect point or mark not awarded
	working towards marking point
	information missing or insufficient for credit
	used to highlight part of an extended response
	used to highlight part of an extended response
	allow or accept
	benefit of the doubt given

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Annotation	Meaning
BP	blank page
CON	contradiction in response, mark not awarded
ECF	error carried forward applied
PAG	marking point already given
I	incorrect or insufficient point ignored while marking the rest of the response
IRRL	irrelevant material that does not answer the question
MR	maximum mark reached
O	or reverse argument
R	incorrect point or mark not awarded
SEEN	point has been noted, but no credit has been given or blank page seen

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Mark scheme abbreviations

;	separates marking points
/	alternative answers for the same point
A	accept (for answers correctly cued by the question, or by extra guidance)
R	reject
I	ignore
( )	the word / phrase in brackets is not required, but sets the context
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
AVP	alternative valid point

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(a)</td><td>ref. to hazard and risk and precaution ;

<table><tr><th>hazard</th><th>risk</th><th>precaution</th></tr><tr><td>knife / blade / scalpel / AW</td><td>cuts / injury (skin / hand / AW)</td><td>cut away from the hand
or
cut onto a, board / tile / AW</td></tr><tr><td>avocado / catalase / enzyme / mesocarp</td><td>allergy / irritant</td><td>(wear) gloves / PPE</td></tr><tr><td>hydrogen peroxide / H_2O_2</td><td>irritant / toxic / corrosive / caustic / damage to eyes</td><td>(wear) gloves / goggles / safety glasses / PPE</td></tr></table></td><td>1</td><td>mark as prose
ignore any other hazard
ignore low / medium / high, risk
R no risk
allow cut away from body
ignore cuts clothing / AW ;
ignore gloves as precaution for knife
ignore glasses / goggles
ignore biohazard
ignore hydrogen peroxide harmful
ignore damage / (chemical) burns</td></tr>
<tr><td>1(b)(i)</td><td>time / days, after picking / after harvesting / to ripen
or
level / degree / stages / AW, of ripeness ;</td><td>1</td><td>ignore ripeness / time, unqualified

allow different as AW for level
ignore age ;

A colour of skin

A softness of avocado / mesocarp
ignore softness of skin</td></tr>
</table>

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Question	Answer	Marks	Guidance
1(b)(ii)		**7**	**ignore** *ref. to* control experiment **ignore '**known' for 'same' then **ecf** if repeated throughout **allow** standardised / controlled / fixed / constant **A** mesocarp as AW for avocado
	1 use of **five** different (stages)/AW of ripeness **;**		1 **A** method to obtain 5 stages of ripeness **allow** if 5 different levels of ripeness stated even if less than 5 descriptions given – allow the mark **ignore** age
	*any **six** from:* 2 same / stated / fixed, dimensions of avocado pieces **;**		2 **ignore** removal of skin **ignore** size / mass / volume / SA for dimensions **A** cube with same / stated, dimensions / **linear** measurement(s) **ignore** length and width being the same unless 'cube' is mentioned cube 2 cm × 2 cm – BOD **ignore** any stated dimensions larger than 10 cm **A** cylinders same length **and** diameter (if numbers stated need to see **units** at least once)
	3 use knife / blade / scalpel / AW <u>and</u> ruler / AW (to cut the avocado pieces) **or** use knife / blade / AW <u>and</u> cork-borer <u>and</u> ruler (to cut cylinders) **;**		3 **allow** cutter as AW for knife **allow** vernier calipers as AW for ruler

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Question	Answer	Marks	Guidance
1(b)(ii)	4 use same, species / type / variety, of avocado **or** use same number / amount of pieces (in each beaker) **;**		4 **A** *Persea americana* as same species **A** same tree **A** all pieces cut from same avocado **A** one/ a / the piece
	5 use a suitable method to maintain a constant temperature of hydrogen peroxide **;**		5 suitable methods: water-bath temperature-controlled room **A** air conditioning / heater, set at one temperature **ignore** incubator / air conditioning unqualified if stated, temperature between 10 °C to 40 °C
	6 use same / stated, volume / concentration of hydrogen peroxide / H_2O_2 **;**		**ignore** concentration or volume values
	7 avocado added / AW to hydrogen peroxide **and** immediately start timer **;**		**allow** 'and then' as AW for immediately
	8 suitable method / apparatus for measuring the quantity of oxygen produced / released **;**		8 **A** gas as AW for oxygen **ignore** count bubbles unqualified **allow**: counting bubbles using camera add washing up liquid **and** measure height of foam produced collect oxygen over water / H_2O_2 **and** measure volume in inverted measuring cylinder

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Question	Answer	Marks	Guidance
1(b)(ii)	9 at each stage / AW of ripeness, set / measure / record / fixed period of, time (linked to release of oxygen) **;** 10 at each stage of ripeness take at least three measurements **;** 11 fresh / new / change / *AW*, hydrogen peroxide used in each experiment **/** different stages/AW of ripeness **;**		collect oxygen **and measure volume** in a gas syringe **ignore** syringe **allow** measuring loss of oxygen by loss in mass, using an electric balance and mass change calculated **allow** *idea of* recording time to sink 10 **ignore** calculate a mean **A** three replicates / repeat 2 times, at each stage / AW of ripeness
1(c)(i)	any suitable method of generating random numbers **and** matching to the trees **;**	**1**	e.g. number all the trees **and** use a random number generator (to select the trees) **ignore** quadrats / co-ordinates
1(c)(ii)	*idea of* to reduce the water loss from the avocados (while in storage) / AW **;**	**1**	**A** reduces transpiration **A** reducing water evaporation **allow** no / stop / prevent AW for reduces **allow** losing moisture **ignore** 'keep moist' **ignore** vapour **ignore** prevent drying out **ignore** *ref. to* osmosis
1(c)(iii)	822 ± 412 **and** 736 ± 358 **;**	**1**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(c)(iv)</td><td>correct plotting of both bars (within ½ square) ;;

1 mark per bar</td><td>2</td><td>ecf for incorrect calculations from 1(c)(iii)

if lines are thick or slanted take reading from top edge of bar

<table><tr><td>group</td><td>expected range</td></tr><tr><td>20dR</td><td>410–1234</td></tr><tr><td>30dR</td><td>378–1094</td></tr></table></td></tr>
</table>

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Question	Answer	Marks	Guidance
1(c)(v)	*any **four** from:* *mp2 only valid if mp1 has been awarded* *mp4 only valid if mp3 has been awarded* 1 *conclusion 0d compared with 10 –30d **or** between 10 –30d* effect of (cold storage only on catalase activity) is, variable / increases and decreases / fluctuates / no pattern / trend **;** 2 *data comparison with 0d and 10 / 20 / 30d* **data** from 3 to show fluctuations, 0d / **571 or** 10d / **615 or** 20d / **455 or** 30d / **550 ;** 3 *conclusion 0d / all d with all dR* increased (mean) activity when allowed to ripen / dR (bigger than d) **or** *conclusion all dR compared to 0d* all, dR data / storage times, with ripening have greater (mean) activity than, 0d / **ora ;** 4 *data comparison d with dR* data to compare 10d with 10dR **or** 20d with 20dR **or** 30d with 30dR e.g. 20d 455 v 20dR 822 **or** data to compare 0d / 571 with 10dR / 642 **and** 20dR / 822 **and** 30dR / 736 5 error bars overlap (so may be) no <u>significant difference</u> (in catalase activity) between, all / both, groups / in Figure 1.4 / AW **;** *both = all d data and dR*	**4**	**ignore** units if seen **ignore** *ref. to* dR 0d **571** / 10d and 20d **615** and **455** 0d **571** / 10d and 30d **615** and **550** 0d **571** / 20d and 30d **455** and **550** **allow** dR as AW for 'time to ripening' **allow** stored at 7 degrees / AW for d **allow** stored at (7 and) 20 degrees / AW for dR 4 **ignore** means of all d and all dR ; **A** calculated difference between means **allow** (95%) confidence intervals / CI / SE / standard error as AW for error bars **ignore** the size of error bars / SE / CI **ignore** optimum and **highest** mean activity **A** both groups for all groups **R** results **ignore** values

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Question	Answer	Marks	Guidance
1(c)(vi)	*any **two** from:* (data) **not** normally distributed **;** standard deviations are different **;** more than two means (to compare) **;**	**2**	**R** data is, **not** continuous / discrete / discontinuous / categoric / qualitative **ignore** data is, continuous / quantitative **A** comparing 7 means **ignore** fewer than 30 values

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Question	Answer	Marks	Guidance
2(a)(i)	(use an) identification key / app / expert **;**	**1**	**ignore** photographs unqualified **A** (guide) book / AI / database **ignore** features – spots / colouring / patterns
2(a)(ii)	*any **two** from:* 1 length of (belt) transect **;** 2 same / one, person counting (the butterflies on one transect) **;** 3 time of the day **;** 4 time of the year / season / month **;** 5 (period of) time spent counting **;**	**2**	**accept** any stated length of transect **ignore** width / size / orientation of belt transect **ignore** weather **ignore** time unqualified

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Question	Answer	Marks	Guidance
2(a)(iii)	*any **three** from*: *miscounting:* 1 butterflies can fly so difficult to count / move from place to place therefore may counted more than once / could miss some **;** 2 butterflies maybe, small / camouflaged, so difficult to see so, inaccurate count /miss some **;** 3 difficult to judge 2.5 m distance leading to inaccurate numbers **;** 4 person sampling maybe walking too fast so could miss some **;** *misidentifying:* 5 butterflies, can fly / maybe (very) small, therefore unable to see, features / patterns, so inaccurate identification / difficult to identify **;** 6 some butterflies have similar, colours / patterns, so could misidentify **;** 7 person sampling may, lack the knowledge / AW, so could misidentify **;** 8 person sampling may not be able to, see clearly / AW, so could misidentify**;** 9 person sampling may be walking too fast so could misidentify **;**	**3**	**ignore** human error AW for miscounting – inaccurate numbers / incorrect numbers / counting or recording, higher / lower, numbers / counting more than once / missing some (BOD – without *ref. to* counting or numbers) **allow** inaccurate results for inaccurate numbers AW for misidentification – inaccurate / incorrect identification / hard to identify, wrong identification

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(b)</td><td>
<table>
<tr><td></td><td></td><td colspan="2">prediction</td></tr>
<tr><td></td><td></td><td>rural / farmland and woodland</td><td>urban / towns and cities</td></tr>
<tr><td>1</td><td>food / plants / flowers vegetation</td><td>more…
variety of..</td><td>less…
less variety of ..</td></tr>
<tr><td>2</td><td>habitats / niche / trees</td><td>more</td><td>less</td></tr>
<tr><td>3</td><td>gardens / parks</td><td>less</td><td>more</td></tr>
<tr><td>4</td><td>active conservation of butterflies qualified</td><td>less/more</td><td>more / less</td></tr>
<tr><td>5</td><td>pesticides qualified</td><td>less/more</td><td>less / more</td></tr>
<tr><td>6</td><td>habitat fragmentation</td><td>less</td><td>more</td></tr>
<tr><td>7</td><td>temperature</td><td>colder</td><td>warmer</td></tr>
</table>
</td><td>2</td><td>ignore predators / pollution
ignore light
ignore selection pressures

1 ignore greenery</td></tr>
<tr><td>2(c)</td><td>max 1 (mp2 only) if correct answer with no working shown

1 correct working:
(13 500 – 2300) ÷ 2300 (×100)
or
11 200 ÷ 2300 (×100) ;

2 correct answer / 487 (%) ;</td><td>2</td><td>no ecf for incorrect working
allow alternative method:
% calculated –100

ecf
incorrect values taken from the graph
and
all three figures shown correct formula
and
correct answer from their figures

R if not 3 significant figures</td></tr>
</table>

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