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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/51**

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 **19** 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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Question	Answer	Marks	Guidance
1(a)(i)	*direction* (drop of coloured liquid will move) left / AW **and** *explanation* (oxygen used in respiration) decreases / AW, volume / pressure (of gas in respirometer) **;**	**1**	mark as prose **allow** (move) towards, *O. asellus* / test-tube / AW **ignore** move towards respirometer if nothing on answer line, check diagram and **allow** correct arrow / annotations on Figure 1.2 **ignore** *ref. to* capillary action **ignore** volume / pressure is low (needs to be lower) **A** 'a negative pressure is created'
1(a)(ii)	*idea of* replace (live) *O. asellus* with: sterile / inert / glass / plastic / AW, beads **;** **or** dead / AW, *O. asellus*	**1**	**allow** woodlouse / woodlice / *asellus* / invertebrate / animal / organism as AW for *O. asellus* (shown in Figure 1.2) **ignore** respirometer with no *O. asellus* **R** if change another factor in addition to *O. asellus*

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Question	Answer	Marks	Guidance
1(a)(iii)	*any **six** from:* 1 use a minimum of five stated temperatures **;** 2 suitable method to maintain a constant temperature **;** 3 use, same / stated, mass of, sodium hydroxide / NaOH (pellets) **;** 4 use, same / stated, number / amount / mass, of *O. asellus* **or** use, same / stated, age of *O. asellus* **;**	**6**	**ignore** *ref. to* control experiment **allow** woodlouse / woodlice / *asellus* / invertebrate / animal / organism as AW for *O. asellus* 1 temperatures must include 5 °C **and** 35 °C, but do not need to be evenly spaced must see units at least once **ignore** temperatures outside the range 2 **A** water-bath / incubator **ignore** temperature-controlled room / air conditioning / heater / fridge **A** *ref. to* use thermometer **and** ice **/** warm water (in a beaker) **R** Bunsen burner mp3, 4 & 6 **allow** standardised / controlled / fixed / constant as AW for same **ignore** known 3 **ignore** amount / number, of NaOH pellets **ignore** volume / concentration **allow** any value for mass if stated 4 **ignore** size / length / volume / concentration, of *O. asellus* **ignore** same species / type / sex (of *O. asellus*) **allow** any value for number / mass if stated **ignore** *O. asellus* (collected / bought) from same, environment / population / supplier **ignore** same, food source of *O. asellus* (before investigation)

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(a)(iii)</td><td>5 method to, equilibrate / acclimatise, O. asellus ;

6 at each temperature, measure the distance (moved by the drop of coloured liquid), in a, set / stated, time
or
at each temperature, measure the time (for the drop of coloured liquid), to travel a, set / stated, distance ;

7 for each temperature, take at least three measurements ;

8 safety comment with hazard and risk and precaution ;

<table><tr><th>hazard</th><th>risk</th><th>precaution</th></tr><tr><td>sodium hydroxide (pellets)</td><td>corrosive / caustic / damage to eyes</td><td>(wear) gloves / goggles / safety glasses / PPE</td></tr><tr><td>O. asellus / woodlouse</td><td>allergy / biohazard / pathogens / infection</td><td>(wear) gloves / PPE</td></tr></table></td><td></td><td>5 A leave O. asellus (in respirometer), in water-bath / at a set temperature, for, set / stated, time
if stated, minimum time 5 minutes

6 allow note / record as AW for measure
ignore calculate as AW for measure
allow length / mm / cm as AW for distance
ignore known time (in question stem)
allow ‘how far’ as AW for distance
allow ‘how long’ as AW for time
ignore ref. to measuring without sodium hydroxide

allow measuring the initial and final distance
allow any value for distance / time if stated
do not allow measuring distance and time if neither is set / stated

7 ignore calculate a mean
A three replicates / repeat 2 times, at each temperature

8 ignore low / medium / high, risk
R no risk

ignore heat / temperature / hot water as hazard
ignore irritant / toxic / burns as risk for sodium hydroxide
ignore irritant / toxic as risk for O. asellus</td></tr>
</table>

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Question	Answer	Marks	Guidance
1(a)(iv)	distance (in mm) **and** multiplied by, πr^2 / area (of glass tube cross-section) **and** divided by time (in minutes) **;**	**1**	**allow** d / h / l for distance **allow** t for time **allow** over time / multiply by 1/t, as AW for divide by time **ignore** per as AW for divided (in question stem) **ignore** units if stated **A** d π r^2 / t *r* = radius of glass tube **allow** π $d^2/4 = \pi r^2$ (where d = diameter)
1(b)(i)	(different / type of) respiratory substrate (solutions) **;**	**1**	**A** (20%) glucose and (20%) maltose (solutions) **A** (different / type of) sugar (solutions) **R** concentration of, glucose / maltose / sugar (solutions)
1(b)(ii)	add 4 cm^3, (50%) stock (solution of glucose) to, 6 cm^3, distilled water **;**	**1**	**allow** ml as AW for cm^3 **allow** (50%) glucose (solution) as AW for stock solution **allow** deionised / pure, water as AW for distilled water **ignore** water unqualified **ignore** $C_1V_1 = C_2V_2$ **A** use 4 cm^3 stock solution and top up to 10 cm^3, with distilled water

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Question	Answer	Marks	Guidance
1(b)(iii)	*any **two** from:* 1 concentration of yeast / mass of yeast (in suspension) **;** 2 species / variety / type / age / AW, of yeast **;** 3 temperature **;** 4 pH **;** 5 size of (small) test-tube **;**	**2**	**ignore** volume of yeast suspension **ignore** volume / concentration, of, respiratory substrate / glucose / maltose / sugar, solution **ignore** time **ignore** light intensity **ignore** carbon dioxide / oxygen, concentration **R** type of respiratory substrate **R** volume of gas 3 **R** temperature that (solutions / AW) were boiled at
1(c)(i)	*type of data:* nominal / discontinuous **;**	**1**	**ignore** categoric / qualitative / independent (*as these are types of variable*) **R** quantitative / continuous / interval / ordinal / discrete / dependent

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(c)(ii)</td><td>(mean) volume (of gas collected after 30 minutes), is, greater / AW, with, glucose (than with maltose) / ora
and
data quote (from Figure 1.5) ;</td><td>1</td><td>allow rate of, fermentation / (anaerobic) respiration, as AW for volume (of gas)
ignore (glucose is) better / AW

data quotes:
candidates should give data quotes for glucose and maltose or the calculated difference.
need units at least once
allow ml as AW for cm^3

<table>
<tr><th>respiratory substrate</th><th>volume of gas / cm^3</th></tr>
<tr><td>glucose
maltose</td><td>1.85 to 1.90 (e.g. 1.875)
1.45</td></tr>
<tr><td>calculated difference</td><td>0.40 to 0.45
(e.g. 0.425)</td></tr>
</table>
</td></tr>
</table>

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Question	Answer	Marks	Guidance
1(c)(iii)	*any **two** from:* 1 maltose, is a <u>disaccharide</u> / is not a <u>monosaccharide</u>, and needs to be hydrolysed (into glucose) **or** glucose, is a <u>monosaccharide</u> / is not a <u>disaccharide</u>, and does not need to be hydrolysed **;** 2 *idea that* only glucose enters, <u>glycolysis</u> **; ora** 3 *idea that* entry of glucose into yeast cells is faster **;**	**2**	**ignore** easier / more efficient **ignore** harder / more difficult **ignore** spelling of underlined words if it is clear what is meant 1 **allow** broken down / digested / converted (to glucose), as AW for hydrolysed **ignore** glucose is, broken down / AW **ignore** glucose is, easier / AW, to break down **ignore** maltose is, harder / AW, to break down 2 **A** maltose cannot enter <u>glycolysis</u> (unless it has been broken down) **ignore** respiration unqualified 3 **A** more glucose transporters available in yeast cells (than maltose transporters) **A** *idea that* gene expression for maltose, transporter / enzyme / maltase / AW, takes time

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Question	Answer	Marks	Guidance
2(a)(i)	*any **two** from:* 1 (data is) continuous **;** 2 (data is) normally distributed **;** 3 standard deviations are (approximately) the same **;** 4 fewer than 30, values / birds / AW (for each song type) **;**	**2**	**ignore** comparing / difference, between (two) means (in question stem) 1 **ignore** quantitative data **R** discrete / discontinuous / categoric / nominal / qualitative, data 4 **A** 11 birds of song type A **and** 13 birds of song type B
2(a)(ii)	there is no, difference, in the (mean) bill length, between, (male) *G. conirostris* (with song) type **A**, and (male *G. conirostris* with song) type **B ;**	**1**	**allow** birds / finches / males, as AW for *G. conirostris* **allow** beaks as AW for bills **ignore** significant **ignore** (mean) mass **ignore** (mean) bill, depth / width **R** no, correlation / relationship / association **R** female (*G. conirostris*)
2(a)(iii)	22 **;**	**1**	11 + 13 – 2 = 22

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Question	Answer	Marks	Guidance
2(a)(iv)	1 calculated (*t*-) value / 3.768, is greater than, 2.074 (critical value at df = 22 and $p = 0.05$) **; ora** 2 null hypothesis / H_0, is rejected **;** 3 there is a <u>significant difference</u> **;**	**3**	check Table 2.2 and answer for 2aiii **ecf all mp** for incorrect df / NR in **2aiii** 1 **ignore** t-value unqualified (could be the calculated or critical values) need to state correct critical value (for their df) **allow** correct critical value from table (circled / underlined etc) mp 2 & 3 **ecf** incorrect critical value to max 2 2 **R** null hypothesis is accepted 3 **R** correlation / relationship / association 3 **A** greater than 95% probability that the <u>difference</u> (between the means) is not due to chance / is significant **or** less than 5% probability that the <u>difference</u> (between the means) is due to chance **/** is not significant

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Question	Answer	Marks	Guidance
2(b)		**2**	**allow** bird / finch as AW for *G. conirostris* **ignore** repeats / do a statistical test each food source = prickly pear **and** palo santo tree (or several different sources)
	1 measure / AW, time spent, feeding / eating / AW, on each food source **;**		1 **allow** note / record / calculate as AW for measure **allow** 'how long' as AW for time **ignore** observe time for mp1 **ignore** time at location (needs to be time spent eating) **ignore** calculate, percentage / proportion (of time)
	*any **one** from:* 2 *idea of* method to identify, individual / song type, (male) *G. conirostris* **;**		**INTERNAL MAX** 2 **allow** use of, rings / paint / markings to identify, individual / song type **ignore** listen unqualified
	3 *idea of* method to observe (feeding of male) *G. conirostris* on each food source **;**		3 **allow** lab-based or field-based methods **do not accept** ref. to birds with only one food source (birds must have a choice of food sources) **A** natural habitat (with both food sources) **and** observe **A** feeding stations with both food sources **and** observe **A** cage / AW, containing both food sources **and** observe **A** camera / AW (to observe), birds (feeding) on both food sources

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Question	Answer	Marks	Guidance
2(c)	*any **four** from:* *supports the conclusion:* 1 *idea that* different groups (of *G. conirostris*) would have different selection pressures **;** 2 *idea that* differences between the two groups (of *G. conirostris*) will lead to, reproductive / genetic / behavioural / ecological, isolation **;** 3 there is no geographical separation **; ora** *extend the investigation:* 4 study female (*G. conirostris*) **;**	**4**	**allow** bird / finch as AW for *G. conirostris* **allow** beak as AW for bill **ignore** *ref. to* different islands / allopatric speciation 1 & 2 **allow** population / types as AW for groups **R** ref. to (two) species (penalise once and ECF) 1 different / two, groups = song type A and song type B / different bill lengths **ignore** (changing) allele frequencies unqualified **allow** description of selection pressure: e.g. **A** (male) *G. conirostris* with different bill lengths are adapted to feed on different food sources e.g. **A** female *G. conirostris* will select one song type of male *G. conirostris* for mating 2 & 3 **allow** separation as AW for isolation 3 **A ora** same geographical location **A** no physical barrier **A** geographical ranges (of the two groups) overlap **ignore** improvements to the original investigation **ignore** repeat investigation unqualified **ignore** repeat, in different seasons / at different times of the year **ignore** study a larger sample **ignore** do a statistical test

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Question	Answer	Marks	Guidance
2(c)	5 *idea of* studying (*G. conirostris*) for several generations **;**		5 **ignore** longer time unqualified **allow** many / multiple as AW for several **allow** several years if stated, **allow** 3 or more years as AW for several years
	6 use DNA analysis / AW **;**		6 **allow** DNA sequencing / DNA profiling / genetic fingerprinting / genetic screening

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