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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/44**

Paper 4 A Level Structured Questions **May/June 2026**

MARK SCHEME

Maximum Mark: 100

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 **22** 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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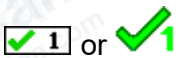
Annotations guidance for centres

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
GM	mark already given
I	incorrect or insufficient point ignored while marking the rest of the response
MAX	maximum number of marks for a marking point has been awarded
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></tr>
<tr><td>1(a)</td><td>X attached to operator ;</td><td>1</td></tr>
<tr><td>1(b)</td><td>
<table>
<tr><th>structural gene</th><th>gene product</th><th>role of gene product</th></tr>
<tr><td>lacZ</td><td>β-galactosidase</td><td>hydrolyses lactose to form glucose and galactose</td></tr>
<tr><td>lacY</td><td>lactose permease
or
β-galactoside permease</td><td>idea that lactose can enter,
cell / bacterium</td></tr>
<tr><td>lacA</td><td>transacetylase</td><td>transfers an acetyl group from one molecule to another</td></tr>
</table>
One mark for each correct column</td><td>2</td></tr>
<tr><td>1(c)</td><td>(enzyme that is only) produced when, the substrate / lactose / inducer, is present ; A in larger amounts</td><td>1</td></tr>
</table>

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Question	Answer	Marks
1(d)	*any **four** from:* **B** - *population remains constant* 1 *ref. to* glucose has been used up **;** 2 (so bacterial) replication / division / binary fission, stops / slows **;** **B/C** 3 *lac* operon / (named) structural gene(s), switched on / transcribed / expressed **or** (named) enzyme(s) synthesised **;** **C** – *population size increases* 4 (so more) lactose enters **;** 5 lactose, hydrolysed / broken down, into, glucose / galactose (to make ATP) **;** 6 (for bacterial) replication / division / binary fission **;**	**4**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>
<table>
<tr><th>ion</th><th>direction of movement of ion and type of cell</th><th>action that results from movement of ion</th></tr>
<tr><td>K^+</td><td>into guard cells ;</td><td>opening of stoma(ta)</td></tr>
<tr><td>Na^+</td><td>into synaptic knob of presynaptic neurone</td><td>depolarisation (of presynaptic membrane)
or
action potential generated ;</td></tr>
<tr><td>Ca^{2+}</td><td>into synaptic knob of presynaptic neurone</td><td>vesicles, move towards / fuse with, (presynaptic) membrane
or
exocytosis of acetylcholine / described ;</td></tr>
<tr><td>Ca^{2+} / calcium ion ;</td><td>from sarcoplasmic reticulum to sarcoplasm of cell of striated muscle</td><td>binding to troponin</td></tr>
</table>
</td><td>4</td></tr>
<tr><td>2(b)</td><td>any four from:

1 Na^+ concentration in cells, decreases / is low
or
Na^+ concentration gradient formed ;

2 Na^+ enter cells from, filtrate / lumen ;

3 ref. to cotransport of glucose (from, filtrate / lumen) into cells ;

4 glucose concentration in cells increases ;

5 glucose moves (out of cells) into the blood ;</td><td>4</td></tr>
</table>

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Question	Answer	Marks
3(a)	*any **four** from:* 1 habitat, destruction / loss **;** **A** deforestation 2 (illegal) trade / human hunting / poaching **;** 3 **decreased**, food (supply) / prey (numbers) or **increased** competition for food **;** 4 **increased** predation **;** **A** new predator 5 (named) climate change e.g. drought / global warming **or** pollution **;** 6 **new** disease **;**	**4**
3(b)	146 / 145 **;;** *max 1 mark if answer not to whole number*	**2**
3(c)	*any **three** from:* 1 (respiration) involves (named) enzyme **;** 2 low kinetic energy **;** 3 fewer collisions between enzyme and substrate / fewer enzyme-substrate complexes formed **;** 4 lower rate of diffusion (of named metabolite) **;** e.g. oxygen / glucose 5 AVP **;** e.g. less NAD available	**3**

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Question	Answer	Marks
3(d)	*any **four** from:* 1 multicellular ; 2 heterotrophic ; 3 eukaryotic / nucleus ; 4 reproduction (mostly) sexual ; 5 *ref. to* glycogen (store) ; 6 motile / mobile ; 7 nervous system ;	**4**

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Question	Answer	Marks
4(a)	*any **six** from:* 1 allopatric (speciation) **;** 2 geographical, isolation / separation / barrier (between populations) **or** *ref. to* Panama / land / barrier, separating populations **;** 3 (so) reproductive isolation / no gene flow / no interbreeding (between populations) **;** 4 **different** mutations **;** 5 **different**, selection pressures / environments **;** 6 **different**, alleles selected for / changes in allele frequency / gene pools **;** 7 *ref. to* (named) behavioural / ecological / niche, **differences** (between populations) **;** 8 no longer interbreed to produce fertile offspring **;**	**6**
4(b)	*ecosystem* 1 interactions of, community / **all** species / **all** populations **;** 2 *ref. to* abiotic / physical / non-living, **and**, biotic / biological / living, factors / environment **;** *niche* 3 role / function, of a species (in its ecosystem) **;**	**3**

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Question	Answer	Marks
5(a)(i)	833.3 **;;** $\frac{280-30}{30} \times 100$ *if answer incorrect award one mark for working*	**2**
5(a)(ii)	*any **four** from:* 1 insulin secreted by, pancreas / beta cells / Islets of Langerhans **;** 2 binds to receptors on (cell surface membrane of), liver / muscle, cells **;** 3 glucose transporter (proteins) added to **muscle** cell (surface membrane) **or** **increases** permeability of **muscle** cell (to glucose) **;** 4 **more** glucose enters (cells) **;** 5 **increase** in respiration of glucose **;** 6 glycogenesis **; A** described	**4**
5(b)(i)	glucose oxidase **;** peroxidase **;**	**2**

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Question	Answer	Marks
5(b)(ii)	*any **three** from:* *identical to human insulin* 1 no, allergy / immune response / antibody response / side effects / rejection **;** 2 acts rapidly **;** 3 do not, develop tolerance to it / need larger doses **;** 4 no risk of, disease / infection **;** 5 no / fewer, (named) ethical issues **;**	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)</td><td>S ;
P ;</td><td>2</td></tr>
<tr><td>6(b)(i)</td><td>0.0044 ;
23 ;</td><td>2</td></tr>
<tr><td>6(b)(ii)</td><td>1 as light intensity increases rate of photosynthesis increases / AW ;
2 data quote – 2 light intensities and 2 rates of photosynthesis plus units ;
<table>
<tr><td>relative light intensity</td><td>rate of photosynthesis / min^{-1}</td></tr>
<tr><td>0.0400</td><td>43.5</td></tr>
<tr><td>0.0025</td><td>11.4</td></tr>
<tr><td>difference 0.0375</td><td>difference 32.1</td></tr>
</table>
3 (photosynthesis takes place so) oxygen produced, collects / stays, inside disc / on surface of disc ;
4 disc, less dense / more buoyant / float ;</td><td>4</td></tr>
<tr><td>6(b)(iii)</td><td>1 light <u>intensity</u> no longer limiting ;
2 carbon dioxide <u>concentration</u> / temperature, now limiting ;</td><td>2</td></tr>
</table>

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Question	Answer	Marks
7(a)	symbols ; e.g. N = NF1 allele n = normal allele parents genotype Nn × nn gametes N n × n (n) ; offspring genotypes Nn (Nn) nn (nn) ; offspring phenotypes NF1 unaffected ;	4
7(b)	*any **three** from:* *if test is negative* 1 removes worry / AW ; *if test is positive* 2 early treatment ; 3 helps plan for the future **or** make informed decision whether to continue with pregnancy / family planning ; 4 *ref. to* counselling ; 5 discrimination / confidentiality / privacy ; 6 false positive / AW ;	3

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Question	Answer	Marks
7(c)	*any **three** from:* *idea of* 1 no / less, resting membrane potential / stops Na^+ K^+ pumps from working **;** 2 no / less, action potential / depolarisation **or** no / less, (voltage gated) sodium (ion) / potassium (ion), channels opening **;** 3 no / less, impulse transmission / saltatory conduction / setting up of local circuits **or** damages, myelin sheaths / Schwann cells **;** 4 no / less, synaptic transmission **;**	**3**

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Question	Answer	Marks
8(a)	*any **three** from:* 1 DNA (sample) ; 2 primers ; 3 (free) DNA nucleotides ; 4 heat-stable DNA polymerase / *taq* polymerase ; 5 buffer solution ;	**3**
8(b)	*any **seven** from:* 1 denaturation at 90–98 °C ; 2 breaks hydrogen bonds (in DNA) ; 3 to, produce single strands / separate the (two) strands ; 4 annealing at 50–65 °C ; 5 (so that) primers, anneal / bind, (ss)DNA / complementary bases ; 6 extension / elongation, at 65–75 °C ; 7 *Taq* polymerase binds to primer **or** primer provides, binding site / starting point, for Taq polymerase ; 8 *Taq* polymerase joins, (free) nucleotides / dNTPs, (to single strands) ; 9 to synthesise, complementary / doubled stranded / new, DNA ;	**7**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)(i)</td><td>any four from:

1 H^+ pumped out of, hinge / midrib, cells
or
H^+ pumped into cell walls ;

2 cell wall, loosens / cross-links broken ;

3 calcium pectate dissolves ;

4 Ca^{2+} enter cells ;

5 water enters by osmosis ;

6 cells, expand / become turgid ;

7 (lobes) change from convex to concave ;</td><td>4</td></tr>
<tr><td>9(a)(ii)</td><td>idea that soil contains few, nitrates / (named) ions ;</td><td>1</td></tr>
<tr><td>9(b)</td><td><table>
<tr><th>feature</th><th>nervous system</th><th>endocrine system</th></tr>
<tr><td>signal</td><td>impulse</td><td>hormone ;</td></tr>
<tr><td>how signal is transmitted</td><td>neurone ;</td><td>in blood</td></tr>
<tr><td>type of communication</td><td>electrical</td><td>chemical ;</td></tr>
<tr><td>duration of effect</td><td>short(er)</td><td>long(er) ;</td></tr>
</table></td><td>4</td></tr>
</table>

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Question	Answer	Marks
10(a)	*any **four** from:* 1 glucose phosphorylated (to form fructose (1,6) bisphosphate) **;** 2 fructose (1,6) bisphosphate splits **;** 3 (into) **two**, triose phosphate / TP **;** 4 (triose phosphate / TP) oxidised to pyruvate **;** 5 ATP / reduced NAD, produced **;**	**4**
10(b)	*any **four** from:* 1 fewer / no, acetyl groups combine with coenzyme A **or** less / no, acetyl CoA formed **or** decrease in rate of / stops, link reaction **;** 2 fewer / no, acetyl CoA / acetyl group / acetate / 2C fragment, to combine with oxaloacetate **;** 3 decrease in rate of / stops, Krebs cycle **;** 4 decrease in / stops, production of, reduced NAD / reduced FAD **;** 5 (so) fewer / no, electrons pass along ETC **;** 6 decrease in / stops, oxidative phosphorylation / substrate-linked phosphorylation / ATP production **;**	**4**

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Question	Answer	Marks
10(c)	*labels to:* **A** – ATP synthase **;** **B** – inner membrane **;** **C** – intermembrane space **;** **D** – left hand carrier **;**	**4**

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