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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/42**

Paper 4 A Level Structured Questions **February/March 2026**

MARK SCHEME

Maximum Mark: 100

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.

Cambridge International is publishing the mark schemes for the February/March 2026 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **25** printed pages.

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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 descriptions 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.
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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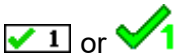
Annotations guidance for centres

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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Question	Answer	Marks
1(a)	*any **three** from:* 1 habitat loss **;** 2 climate change **;** 3 increased hunting **;** 4 increased competition **/** lack of food **;** 5 increased predation **;** 6 new disease **; ignore** disease unqualified 7 effects of pesticides / fertilisers / pollution **;**	**3**
1(b)	*any **three** from:* 1 temperature, warmer than 25 °C / colder than 17 °C **;** 2 dry environment **;** 3 use, fungicides / antifungals / disinfectants / biological control **;** 4 prevent entry of / remove, infected / carrier, frogs **;** 5 monitoring for, fungus / disease **; A** before or after re-introduction	**3**

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Question	Answer	Marks
1(c)	*any **four** from:* 1 eukaryotic / have nucleus ; 2 no, chlorophyll / chloroplasts ; 3 heterotrophic / saprophytic / saprotrophic / parasitic / described ; 4 cell walls made of, chitin / mannoproteins / glucans ; 5 reproduce by spores ; 6 hyphae / mycelium ; 7 multinucleate / AW ; 8 either multicellular **or** unicellular ;	**4**

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Question	Answer	Marks
2(a)(i)	range of values / range of phenotypes / intermediates **;** **A** do not fall into distinct groups	**1**
2(a)(ii)	*any **three** from:* 1 environment has a large effect **;** 2 example of environmental factor relevant to body mass **;** e.g., diet, disease (loss of appetite, use of calories), exercise 3 interaction of environmental factors with genes **or** $V_P = V_G + V_E$ **;** 4 (additive / combined, effect of), many genes / polygenes **;**	**3**
2(b)(i)	*any **two** from:* 1 (mutant *POMC* allele) causes increase in body mass **;** 2 comparative data quote (in support of mp1) **;** 3 heterozygous has intermediate, phenotype / mass **or** one mutant allele has an effect **;** 4 overlap of, error / SD, bars between homozygous normal and heterozygous **or** non-overlap of, error / SD, bars between homozygous mutant and, heterozygous / homozygous normal **;** 5 AVP **;** e.g. variation in body mass within groups shows other factors also contribute / AW	**2**
2(b)(ii)	eat more / do less exercise / AW **;**	**1**

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Question	Answer	Marks
3(a)	*HTT* / huntingtin **;** **A** IT15 huntingtin **;**	**2**
3(b)(i)	*any **one** from:* 1 (close) family history (of Huntington's) **;** 2 adults that have (early) symptoms of Huntington's **;**	**1**
3(b)(ii)	*any **two** from:* 1 adult-onset disease / symptoms generally occur later in life **;** 2 adults can make lifestyle choices **;** e.g. whether or not to have children 3 implications of positive result **;** e.g. at-risk parent may not have taken test e.g. wait to see if parent has Huntington's 4 psychological impact / children not able to give (informed) consent / AW **; ora**	**2**
3(c)	**A** DNA fragments or bands for alleles throughout 1 adult **A** has no alleles with more than 35 (CAG) repeats **; ora** 2 adult **B** has one allele between 35 and 40 (CAG) repeats **;** 3 adult **C** <u>and</u> adult **D** have one allele with more than 40 (CAG) repeats **;** 4 adult **D** has more (CAG) repeats than adult **C** **;**	**4**

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Question	Answer	Marks
3(d)	*any **three** from:* 1 Huntington's disease is (autosomal) dominant **;** 2 addition of normal allele only corrects recessive disorders or dominant allele cannot be, masked / switched off **;** 3 gene therapy does not remove the, mutated / dominant, allele **;** 4 not able to replace, nerve / brain cells **;** 5 correct type of stem cells may not be available **; A** correct ref. to viruses	**3**

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Question	Answer	Marks
4(a)	*any **three** from:* 1 formation of new species from, pre-existing species / (common) ancestor **;** **A** description 2 over, time / generations **;** 3 mutations / changes in gene pools / changes in allele frequencies **;** 4 change in, characteristics / phenotypes **;** 5 natural selection **;** 6 AVP **;** e.g. genetic drift / allopatric / sympatric	**3**
4(b)(i)	**A** names for numbers throughout *any **three** from:* *max **two** for similarities in both figures:* 1 diverged into two groups, at the same time / 67 million years ago 2 *idea that* group 1 is on a different (evolutionary) branch to group(s), 3 / 4 **;** 3 *idea that* group 3 and group 4 diverge more recently / AW **or** group 3 and group 4 on the same (evolutionary) branch **;** *differences:* 4 first divergence resulted in, group 1, in, Figure 4.2 but in, Figure 4.1, group 1, formed later **;** 5 group 2 are closely related to group, 3 / 4, in Figure 4.2 **or** group 2 are closely related to group 1 in, Figure 4.1 **;**	**3**

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Question	Answer	Marks
4(b)(ii)	*any **two** from:* 1 compare, base / nucleotide, sequences (of DNA) **or** identify, similarities / differences, in, base / nucleotide, sequences (of DNA) **;** 2 more similarities means species, are more closely related / have a more recent common ancestor **;** 3 ref. to arrange in groups of shared mutations **;** 4 ref. bioinformatics **; A** description	**2**
4(b)(iii)	data from more species **;**	**1**
4(c)	*any **three** from:* 1 less genetic, diversity / variation **;** 2 alleles not exchanged between non-sister chromatids ; 3 allele combinations remain the same (as parents) **; ora** 4 linkage groups not broken / AW **; ora**	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(a)</td><td>ALLOW one mark if only letters stated in correct order

Table 7.1
<table><tr><th>part of sarcomere</th><th>description</th></tr><tr><td>H zone / band ;</td><td>only myosin present</td></tr><tr><td>A band ;</td><td>actin and myosin present</td></tr><tr><td>I band ;</td><td>only actin present</td></tr><tr><td>M line ;</td><td>attachment for myosin</td></tr><tr><td>Z disc / line ;</td><td>attachment for actin</td></tr></table></td><td>5</td></tr>
</table>

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Question	Answer	Marks
5(b)	*any **four** from:* 1 fewer calcium ions absorbed by muscle (fibres) from the blood **;** 2 fewer calcium ions released by sarcoplasmic reticulum **;** 3 fewer calcium ions bind to troponin **;** 4 fewer, myosin head binding sites exposed on actin / myosin heads bind to actin / cross bridges formed **;** 5 weaker / fewer / slower, power strokes **; A** described 6 weaker / fewer / slower, muscle contraction / sarcomere shortening **;** 7 AVP **;** e.g. fewer calcium ions so less transmission at neuromuscular junction / release of neurotransmitter	**4**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)</td><td>
<table>
<tr><th>name of gene</th><th>type of gene</th><th>name of protein produced</th><th>function of protein produced</th></tr>
<tr><td>lacI</td><td>regulatory ;</td><td>repressor protein</td><td>binds to operator to prevent RNA polymerase binding to promoter</td></tr>
<tr><td>lacZ</td><td>structural</td><td>β-galactosidase</td><td>hydrolyses / breaks down / converts, lactose to glucose and galactose ;

A converts lactose to allolactose</td></tr>
<tr><td>lacY ;</td><td>structural</td><td>lactose permease</td><td>membrane transport protein to increase cellular uptake of lactose</td></tr>
<tr><td>lacA</td><td>structural</td><td>transacetylase</td><td>acetylates galactoside sugar residues to detoxify the cell</td></tr>
</table>
</td><td>3</td></tr>
</table>

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Question	Answer	Marks
6(b)	**ora** for animal insulin *any **five** from:* 1 large scale supply / supply can match demand **;** 2 no / less, chance of immune / allergic response **or** fewer side effects **;** 3 fast to act / smaller dose needed **;** 4 not / less, likely for (insulin) tolerance to occur **;** 5 no / less, risk of, infection / disease **;** 6 no / fewer, ethical / religious, considerations **or** suitable for, vegans / vegetarians **;** 7 cheaper to produce / can control time of production / easier to purify **;**	**5**

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Question	Answer	Marks
7(a)	**A** – podocyte **;** **B** – basement membrane **;** **C** – endothelial (cell) **;**	**3**
7(b)	*any **three** from:* 1 decreased, (glomerular) blood pressure / hydrostatic pressure **;** 2 dehydration / reduced water potential of blood / loss of blood / heart failure **;** 3 (named) kidney disease **; A** diabetes 4 damage to, Bowman's capsule / basement membrane / glomerulus / arterioles **;** 5 ref. to, drugs / hormones, qualified **; A** named or action described e.g. ADH / beta blockers / diuretics	**3**

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Question	Answer	Marks
7(c)	*any **seven** from:* 1 maintain constant internal environment / AW **;** e.g. within narrow limits 2 despite changes in the, internal / external, environment **;** *max **two** from:* 3 named factor **;** e.g. temperature / water potential / blood glucose concentration 4 changes in factor / stimulus, detected by (named) receptor **;** 5 ref. to central control decision / AW **;** e.g. ref. to, brain / CNS / hypothalamus 6 response carried out by effector **;** 7 named effector **;** e.g. muscle / gland 8 corrective action **; A** correct example 9 factor returns to, set point / norm **;** 10 negative feedback **;**	**7**

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Question	Answer	Marks
8(a)	**A** = active transport **;** **B** = anabolism / anabolic (reaction) / polymerisation / bond formation / condensation (reaction) **;** **C** = photoactivation / light activation / photo-ionisation **;**	**3**
8(b)	1 protons diffuse through ATP synth(et)ase **;** 2 protons are pumped into intermembrane space **/** proton gradient formed / ADP + inorganic phosphate **;**	**2**
8(c)	222.4 **; ;** **allow** 1 mark for: $\left[\frac{37.8}{17.0}\right] \times 100$ **or** not to one decimal place	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>1 oxygen concentration decreases (with time) ;

2 oxygen concentration becomes constant when nitric oxide is added ;

3 oxygen concentration remains constant for longer with each addition ;

max three for explanation:

4 (nitric oxide may) prevent oxygen uptake ;

5 (nitric oxide may) inhibit, pyruvate entering mitochondrion / the link reaction / Krebs cycle / ETC / oxidative phosphorylation ;

6 so oxygen cannot act as final electron acceptor ;

7 inhibits aerobic respiration ;

8 effect of nitric oxide is temporary ;</td><td>4</td></tr>
<tr><td>9(b)</td><td>any four from:

<table>
<tr><th>mp</th><th>muscle</th><th>yeast</th><th></th></tr>
<tr><td>1</td><td>lactic acid / lactate</td><td>ethanol</td><td>;</td></tr>
<tr><td>2</td><td>one-step process
A from equation</td><td>two-step process
A from equations</td><td>;</td></tr>
<tr><td>3</td><td>reversible</td><td>irreversible</td><td>;</td></tr>
<tr><td>4</td><td>no carbon dioxide produced /
no decarboxylation</td><td>carbon dioxide produced /
decarboxylation</td><td>;</td></tr>
<tr><td>5</td><td>lactate dehydrogenase</td><td>ethanol / alcohol, dehydrogenase</td><td>;</td></tr>
</table>
</td><td>4</td></tr>
</table>

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Question	Answer	Marks
9(c)	*any **three** from:* 1 aerenchyma in, stems / roots, to provide oxygen to submerged parts **;** 2 tall stems / fast growth of stems / greater internode growth, to hold, leaves / flowers, above water / exposed to air **;** 3 roots have, ethanol / alcohol, dehydrogenase **or** roots are tolerant to ethanol for, ethanol fermentation / anaerobic respiration **;** 4 ridges in submerged leaves to trap air **;**	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>10(a)(i)</td><td>
<table>
<tr><th>crop</th><th>number of stomata</th><th>number of epidermal cells</th><th>stomatal index / %</th></tr>
<tr><td>cotton</td><td>6</td><td>32 ;</td><td>15.8</td></tr>
<tr><td>groundnut</td><td>9</td><td>36</td><td>20.0</td></tr>
<tr><td>mung bean</td><td>5</td><td>12</td><td>29.4</td></tr>
<tr><td>sorghum</td><td>8</td><td>20</td><td>28.6</td></tr>
<tr><td>tomato</td><td>7</td><td>25</td><td>21.9 ;</td></tr>
</table>
</td><td>2</td></tr>
<tr><td>10(a)(ii)</td><td>any two from:
1 allows sufficient, carbon dioxide uptake / gaseous exchange ;
2 reduces, transpiration / water loss ;
3 stomata on lower surface less exposed to, high light intensity / wind ; ora
4 allows more space for photosynthesis ;</td><td>2</td></tr>
</table>

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Question	Answer	Marks
10(b)	**ignore** references to respiration *any **four** from:* *carbon dioxide concentration is decreasing* 1 07:00 to 09:00, light intensity / temperature, is limiting factor **;** 2 as, light intensity / temperature, is increasing rate of photosynthesis is increasing **;** *carbon dioxide concentration is, constant / low* 3 09:00 to 17:30 carbon dioxide concentration is limiting factor **;** 4 as rate of photosynthesis is high **;** *carbon dioxide concentration is increasing* 5 17:30 to 22:00, light intensity / temperature, is limiting factor **;** 6 as, light intensity / temperature, is decreasing the rate of photosynthesis is decreasing **;** *carbon dioxide concentration is, constant / high* 7 22:00–06:00 / 07:00, light intensity is limiting factor **;** 8 as, rate of photosynthesis is low / no photosynthesis **;**	**4**
10(c)	1 thylakoid (membrane) **;** 2 ATP **and** reduced NADP used to convert GP to TP **;** 3 ATP used in regeneration of RuBP **;**	**3**

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