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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/42**

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 **23** 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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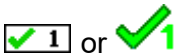
Annotations guidance for centres

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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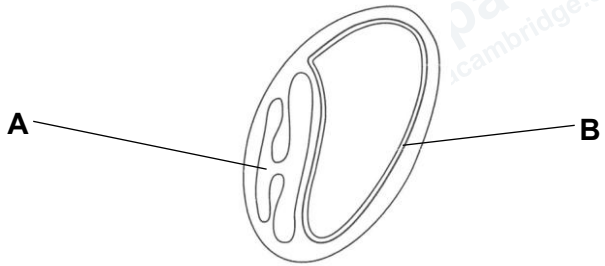
Mark scheme abbreviations

;	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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Question	Answer	Marks
1(a)	**F ;** **A ;** **B ;** **B** and **C ;**	**4**
1(b)	*any **four** from:* 1 (voltage-gated) Na^+ channels open **and** Na^+ move in (to axon / neurone) **;** 2 (so) depolarisation (of membrane) **;** 3 *ref. to* reaching threshold (potential / value / level / voltage) **; R** frequency 4 (voltage-gated) K^+ channels open **and** K^+ move out (of axon / neurone) **;** 5 (so) repolarisation (of membrane) **;** 6 *ref.* to hyperpolarisation (of membrane) **;**	**4**

Question	Answer	Marks
2(a)	 **A** pointing to embryo **;** **B** pointing to aleurone layer **;**	**2**

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Question	Answer	Marks
2(b)(i)	**C** – (gibberellin / GA) receptor **;** **A** GID1 **D** – DELLA (protein / repressor) **;** **E** – transcription factor / phytochrome interacting factor / PIF **;**	**3**
2(b)(ii)	promoter **;** amylase **;** **A** mRNA for amylase	**2**
2(c)	decreases / short(er) / dwarf **;**	**1**

Question	Answer	Marks
3(a)(i)	*any **three** from:* 1 PCR to amplify DNA **;** 2 (gel) electrophoresis, to compare / separate, DNA fragments **;** 3 microarray to, compare / analyse, genomes **;** **A** polymorphisms 4 database / bioinformatics, to, compare / analyse, sequences of, (DNA) bases / nucleotides **;**	**3**

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Question	Answer	Marks
3(a)(ii)	*any **four** from:* 1 allopatric (speciation) ; 2 *idea of* no *contact* so, reproductive isolation / no gene flow (between populations) ; 3 **different** mutations occur (in each population) ; 4 **different** selection pressures (for each population) ; 5 *ref.* to (named) morphological / (named) behavioural / ecological / niche, **differences** (between populations) ; 6 **so** can no longer interbreed to produce fertile offspring ;	**4**
3(a)(iii)	1 they are now different species / speciation **has taken place** ; 2 (different mating calls shows) behavioural, isolation / separation ; 3 (when **S** female and **N** male mate) offspring not produced / (fertilised) eggs are not viable ;	**3**
3(b)	1 genes / genetic **and** environment(al) ; 2 polygenes / many genes involved ; 3 diet / food (availability) / competition for food / nutrients / temperature / disease ;	**3**

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Question	Answer	Marks
4(a)	1. (deliberate) manipulation / changing, of, DNA / genetic material / genome **;** 2. to, modify / improve / add, (named) characteristics of, organism / crop / plant **;** 3. *ref. to* add / delete / replace, gene / allele (into crop) **or** gene editing **; A** CRISPR	**3**
4(b)	any answer between 295 and 305 **;** $\frac{(170 - 42.5)}{42.5} \times 100$ *If incorrect answer max 1 mark for this equation*	**2**

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Question	Answer	Marks
4(c)	*any **five** from:* 1 *idea of* increase / high, productivity / yield / food quantity **;** **A** named example 2 improve (named) quality **;** 3 *ref. to* herbicide / weedkiller, tolerance / resistance **;** 4 reduces / no, competition from weeds **or** so crops get more, light / water / AW **;** 5 *ref. to* insect / pest, resistance **;** 6 less / no, crop damage **or** less food wastage **;** 7 *ref. to* economic advantage **;** 8 tolerance to name factor **;** e.g. disease / environmental extreme / frost / high temperatures / windy / less fertile soil	**5**

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Question	Answer	Marks
5(a)	parental phenotypes: ash-red male blue female parental genotypes: $Z^{A}Z^{Br}$ $Z^{Bl}W$; offspring parental gametes → Z^{Bl} ; W Z^{A} — genotype: $Z^{A}Z^{Bl}$ ash-red male; genotype: $Z^{A}W$ ash-red female Z^{Br} — genotype: $Z^{Bl}Z^{Br}$ blue male; genotype: $Z^{Br}W$ brown female *allow one mark for correct parental gametes (in either orientation on the table)* ; *allow one mark for correct offspring genotypes* ; *allow one mark for correct matching colour **and** sex phenotypes* ; *if male parent is incorrect then ecf max 1 for correct offspring genotypes from gametes*	**4**
5(b)	sex-linkage ; multiple alleles / dominance hierarchy ;	**2**

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Question	Answer	Marks
5(c)	1 cross (ash-red male) with **brown** female **; Ignore** genotype Z^{Br} W *plus any **two** from:* 2 if **all** offspring are ash-red then (male parent is), $\mathbf{Z^A\ Z^A}$ / AW **; A** homozygous for $\mathbf{Z^A}$ 3 if (any) offspring are blue then (male parent is), $\mathbf{Z^A\ Z^{Bl}}$ / AW **;** 4 if (any) offspring are brown then (male parent is), $\mathbf{Z^A\ Z^{Br}}$ / AW **;**	**3**

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Question	Answer	Marks
6(a)	facilitated diffusion **;**	**1**
6(b)	480 **;** *max 1 if not as a whole number 479.5918367* If standard form incorrect allow *max 1 if evidence of 4.7 divided 9.8*	**2**
6(c)	*any **four** from:* 1 *ref. to*, many, impulses / action potentials (occurring) **or** many synapses / many connections between neurones **;** 2. *ref. to* sodium potassium pump / active transport of Na^+ and K^+ **; R** channel 3 setting up / maintaining, ion gradient(s) **;** 4 setting up / maintaining, resting potential(s) **;** 5 production / recycling, of, neurotransmitters / acetylcholine / ACh **;** 6 production / recycling / movement, of vesicles **or** exocytosis (of neurotransmitter) / endocytosis **; R** exocytosis of vesicles 7 production of acetylcholinesterase **;**	**4**

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Question	Answer	Marks
6(d)	*any **three** from:* 1 (caffeine) binds to (adenosine) **receptors ; R** active site **or** inhibits / blocks, binding of adenosine to **receptors** / AW **;** 2 less ATP made during sleep / more ATP made whilst awake **;** 3 postsynaptic (neurone) activity is not inhibited / can occur / AW **;** 4 (less adenosine bound to receptors) cannot promote sleep / promotes wakefulness / AW **;**	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(a)</td><td>class
and
family ;

Coenagrion
and
(Coenagrion) mercuriale ;</td><td>2</td></tr>
<tr><td>7(b)</td><td>any four from:

<table>
<tr><th></th><th>Animalia</th><th></th><th>Plantae</th><th></th></tr>
<tr><td>1</td><td>no, chloroplasts / chlorophyll</td><td>vs</td><td>chloroplasts / chlorophyll</td><td>;</td></tr>
<tr><td>2</td><td>heterotrophic / cannot photosynthesise / described</td><td>vs</td><td>autotrophic / phototroph / can photosynthesise / described</td><td>;</td></tr>
<tr><td>3</td><td>no cell walls</td><td>vs</td><td>cell walls</td><td>;</td></tr>
<tr><td>4</td><td>vacuoles, small / temporary</td><td>vs</td><td>vacuoles, large / permanent</td><td>;</td></tr>
<tr><td>5</td><td>glycogen (store)</td><td>vs</td><td>starch (store)</td><td>;</td></tr>
<tr><td>6</td><td>locomotion / motility / mobility</td><td>vs</td><td>no,
locomotion / motility / mobility</td><td>;</td></tr>
<tr><td>7</td><td>nervous system</td><td>vs</td><td>no nervous system</td><td>;</td></tr>
</table>
</td><td>4</td></tr>
</table>

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Question	Answer	Marks
7(c)(i)	*any **four** from:* 1 habitat, destruction / loss **Ignore** deforestation **or** decrease in, open vegetation / slow-flowing water **or** *ref. to* (now) fast-flowing water **;** 2 (named) **water** pollution **;** 3 **reduction** in, (named) food (supply) / prey (numbers) **or** **increased** competition for food **;** 4 **increased** predation **; A** new predator 5 (named) climate change **;** e.g. flooding / drought / change in water temperature / global warming 6 **new** disease **;**	**4**
7(c)(ii)	*any **two** from:* 1 (flying insects / adults) difficult to, (re)capture / mark **;** 2 *idea of* adults not alive long enough to be caught twice / adults may die before being caught for the second time / new adults emerge before recapture **;** 3 *ref. to* migration **;** 4 small population **;**	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>
<table>
<tr><td>location of Na^+ / K^+ pumps</td><td>P</td><td>;</td><td>Ignore Q</td></tr>
<tr><td>location of cotransport proteins</td><td>S</td><td>;</td><td>Ignore P</td></tr>
<tr><td>structures through which glucose molecules pass</td><td>P + S</td><td>;</td><td>Ignore Q</td></tr>
<tr><td>prevents leakage of fluid</td><td>R</td><td>;</td><td></td></tr>
</table>
</td><td>4</td></tr>
<tr><td>8(b)</td><td>
any seven from:
1 increase in ADH released ; Ignore produced A secreted
2 (ADH released from) posterior pituitary ;
3 ADH binds to receptors ;
4 in, cell surface / basal, membrane, of collecting duct (cells) ;
5 cAMP / secondary messenger, produced ;
6 ref. to enzyme cascade / signal amplification / described ;
7 vesicles (with aquaporins) move to / fuse with, cell surface / luminal, membrane ;
8 more aquaporins in the, cell surface / luminal, membrane ;
9 increase in (cell / membrane / collecting duct) permeability to water ;
10 (more) water moves out of, lumen / collecting duct / filtrate, into, cell / tissue fluid / blood ;
11 by, osmosis / down the water potential gradient ;
12 (more) concentrated / small(er) <u>volume</u>, urine produced ;
</td><td>7</td></tr>
</table>

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Question	Answer	Marks
9(a)	*any **three** from:* *less hexokinase so:* 1 less glucose, phosphorylated / activated ; 2 less glucose diffuses into cell (as less steep concentration gradient) ; 3 less, glycolysis / formation of pyruvate ; 4 less ATP formed ; 5 loss of red blood cells / anaemia / less oxygen transport ; *plus* *symptom* 6 fatigue / shortness of breath / faint / feeling dizzy ;	**4**
9(b)	*any **four** from:* 1 acetyl CoA / acetyl group / acetate / 2C fragment, combines with oxaloacetate to form citrate ; 2 decarboxylation / carbon dioxide produced ; 3 dehydrogenation / oxidation (of named intermediate) ; 4 reduced, NAD / FAD, produced ; 5 ATP produced by substrate-linked <u>phosphorylation</u> ; 6 oxaloacetate, recycled / regenerated / formed again ;	**4**

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Question	Answer	Marks
9(c)	*any **three** from:* 1. pyruvate / (net 2) ATP, formed by glycolysis **or** substrate-linked phosphorylation occurs in glycolysis **;** 2 pyruvate **reduced** by reduced NAD **; Reject** pyruvate is dehydrogenated 3 lactate formed / lactate fermentation **; A** lactic acid 4 NAD, regenerated / recycled **or** reduced NAD oxidised (to NAD) / reduced NAD converted to NAD **;** 5 AVP **;** e.g. lactate dehydrogenase	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>10(a)</td><td>any four from:

<table>
<tr><th></th><th>structure</th><th>function in photosynthesis</th></tr>
<tr><td>1</td><td>stroma</td><td>site of, (enzymes in) light-independent stage / Calvin cycle ;</td></tr>
<tr><td>2</td><td rowspan="2">thylakoid membranes</td><td>site of, light-dependent stage / photosystems / (named) pigments / oxygen-evolving complex ;</td></tr>
<tr><td>3</td><td>contains, electron transport chain / ETC / ATP synthase / electron carriers ;</td></tr>
<tr><td>4</td><td><u>grana / granum</u></td><td>to contain many, (named) pigment / photosystems
or
increase surface area for light (energy) absorption ;</td></tr>
<tr><td>5</td><td>thylakoid, space / lumen</td><td>ref. to setting up proton gradient / contains a high concentration of protons ;</td></tr>
<tr><td>6</td><td>DNA</td><td>codes for (named) proteins / ribosomes ;</td></tr>
<tr><td>7</td><td>ribosomes</td><td>translation (of mRNA) into / production of, (named) proteins ;</td></tr>
</table></td><td>4</td></tr>
<tr><td>10(b)(i)</td><td>B = 0.42 ;</td><td>1</td></tr>
<tr><td>10(b)(ii)</td><td>A = carotene

B = chlorophyll b ;</td><td>1</td></tr>
</table>

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Question	Answer	Marks
10(b)(iii)	*any **two** from:* 1 act as accessory pigments **;** **Ignore** secondary pigments 2 absorbs light wavelengths **not** absorbed by, reaction centre / primary pigment / chlorophyll a **;** 3 so extends the range of wavelengths absorbed **;** 4 pass **energy** to, reaction centre / primary pigment / chlorophyll a **;**	**2**

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