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CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/43**

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 **20** 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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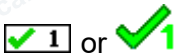
Annotations guidance for centres

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 ;** **E ;** **C ;** **D ;**	**4**
1(b)	*any **five** from:* 1 *ref.to* muscles need a large ATP supply / muscles have high respiration rate **;** 2 glucose used up / glucose (concentration) becomes low(er) **;** 3 glucagon released (by alpha cells in pancreas) **;** 4 glycogenolysis / gluconeogenesis (in liver cells) **; A** description 5 glucose released into <u>blood</u> ***/*** <u>blood</u> glucose (concentration) increases **;** 6 *ref. to* water loss through sweating **;** 7 *idea of* ADH reducing water loss **; A** vasopressin 8 AVP **;** e.g. adrenaline (on muscle cells / liver cells) causes, glycogenolysis / gluconeogenesis e.g. cortisol causes gluconeogenesis in liver cells / supresses insulin release	**5**

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Question	Answer	Marks
2(a)	**A** – prophase II **;** **B** – telophase I **;** **A** (early) prophase II **C** – metaphase II **;**	**3**
2(b)	*any **three** from:* 1 (chromosomes with) same, genes / gene loci **;** 2 (but potentially) different alleles **;** 3 one inherited from each parent **/** one maternal and one paternal chromosome **;** 4 same, size / length **;** 5 same, shape / position of centromere **;** 6 AVP **;** e.g. same banding pattern	**3**
2(c)	*any **three** from*: 1 (meiosis) produces gametes **;** 2 (gametes) are haploid / have one set of chromosomes **;** 3 fertilisation / fusion of gametes, form a zygote **;** 4 zygote, is diploid / has two sets of chromosomes **;** 5 maintains chromosome number / prevents a change in chromosome number **;**	**3**

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Question	Answer	Marks
3(a)	1 *idea of* use primers, specific / complementary / AW, to mutant (*HBB*) allele ; 2 denature DNA / separate DNA into (two) strands ; 3 annealing / binding, of primers ; 4 DNA, elongation / extension / synthesis / replication ;	4
3(b)	homozygous normal = 3 homozygous mutant = 1 heterozygous = 2 and 4 *one correct = one mark* *all three correct = two marks* ; ;	2
3(c)	*any **four** from:* 1 take DNA sample from cell (of person) ; 2 make DNA single-stranded ; 3 add fluorescent, label / tag / dye / chemical, to the DNA (sample) ; **R** marker gene 4 microarray / chip, has (ss)DNA, probe(s) for mutant (*HBB*) allele ; 5 (ss)DNA, hybridises with / binds to / complementary base pairs with, probe(s) (on microarray) ; 6 fluorescence shows presence (of mutant allele) ; 7 AVP ; e.g. *ref. to* wash off excess (ss)DNA after hybridisation UV light / laser (scan), to see fluorescence	4

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Question	Answer	Marks
4(a)	1 $q = \sqrt{0.11}$ **or** $q = 0.33166$ **and** $p = 1 - 0.33166$ **or** $p = 0.66834$ **;** 2 $2pq = 2 \times 0.66834 \times 0.33166$ **or** $2pq = 0.44332$ **and** $\times 100$ **;** 3 44 **;** *max 1 if no working is shown but have correct answer*	**3**
4(b)	*apply ora throughout* 1 (only) continuous, is polygenetic / involves more than two genes / involves many genes **;** 2 in continuous different alleles have a small(er) effect (on the trait) **;** 3 (only) continuous has, genes / alleles, showing an additive effect **;**	**3**
4(c)	*any **three** from:* 1 founder effect / genetic drift **; A** description 2 geographical, isolation / separation / barrier (between populations) **;** 3 no gene flow / no interbreeding / reproductive isolation (between populations) **;** 4 **different** mutations occurred **;** 5 **different**, selection pressures / environments **;** 6 **different** changes in allele frequencies **;**	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(a)</td><td>recessive

phenotype of (recessive) allele is masked by a dominant allele
or
two copies of the (recessive) allele are needed for phenotype (to be displayed)
or
alleles only affect the phenotype in the absence of a dominant allele
or
(genotype) must be homozygous for the (recessive) allele to affect the phenotype ;

codominant

both alleles affect the phenotype (in the heterozygote) ;</td><td>2</td></tr>
<tr><td>5(b)</td><td><table><tr><th>blood group</th><th>genotypes</th></tr><tr><td>A</td><td>$I^A I^A$ $I^A I^O$</td></tr><tr><td>B</td><td>$I^B I^B$ $I^B I^O$</td></tr><tr><td>AB</td><td>$I^A I^B$</td></tr><tr><td>O</td><td>$I^O I^O$</td></tr></table>; ; ;</td><td>3</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(c)</td><td>
parental phenotypes: (B Rh+ O Rh+)

parental genotypes: $I^B I^O$ Dd $I^O I^O$ Dd

<table>
<tr><td>parental gametes</td><td>I^BD</td><td>I^Bd</td><td>I^OD</td><td>I^Od</td></tr>
<tr><td>I^OD</td><td>$I^B I^O$DD
B Rh+</td><td>$I^B I^O$Dd
B Rh+</td><td>$I^O I^O$DD
O Rh+</td><td>$I^O I^O$Dd
O Rh+</td></tr>
<tr><td>I^Od</td><td>$I^B I^O$Dd
B Rh+</td><td>$I^B I^O$dd
B Rh-</td><td>$I^O I^O$Dd
O Rh+</td><td>$I^O I^O$dd
O Rh-</td></tr>
</table>
ratio of offspring phenotypes:

B Rh+ : O Rh+ : B Rh- : O Rh-
3 : 3 : 1 : 1

allow one mark for correct parental genotypes ;
allow one mark for correct parental gametes ;
allow one mark for correct offspring genotypes ;
allow one mark for correct, matching, phenotypes ;
allow one mark for correct ratio ;
apply ecf – if incorrect parental phenotype for gene I, ecf for Rhesus gene, evidence of correct parental gametes, offspring genotypes and matching phenotypes to max 3 marks
</td><td>5</td></tr>
</table>

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Question	Answer	Marks
6(a)	*any **six** from:* 1 afferent arteriole is wider than efferent (arteriole) **;** 2 (creates) high(er), hydrostatic / blood, pressure **;** 3 in, glomerulus / capillaries **;** 4 fluid / water / plasma, **forced** through gaps between endothelial cells **;** 5 basement membrane acts as a (molecular) **filter ;** 6 only, named molecules / ions / molecules less than 68 000–70 000 (R)MM, can pass through (basement membrane) **or** red blood cells / large proteins, cannot pass through (the endothelium) **;** 7 podocyte has, gaps / slits / projections / pores **;** 8 fluid / water / filtrate, passes into the, Bowman's capsule **;**	**6**
6(b)	*any **three** from:* 1 reduces secretion of ADH **; Ignore** production 2 *idea that* less / no, ADH binds to receptors (at the collecting duct) **;** 3 *ref. to* fewer / no, aquaporins, in / added to, membranes (of cells in collecting duct) **;** 4 *ref. to* less water reabsorbed (at collecting ducts) **;** 5 increase in blood pressure so increase, in GFR / volume of glomerular filtrate **;**	**3**

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Question	Answer	Marks
7(a)	*any **three** from:* 1 habitat, destruction / loss **;** **A** deforestation 2 reduction in, food (supply) / prey (numbers) **or** increased competition for food **;** 3 hunted (by humans) for, food / bushmeat **or** increased predation **;** **A** new predator 4 (named) climate change **;** e.g. drought / global warming 5 **new** disease **;** 6 illegal pet trade **;**	**3**
7(b)	*any **four** from:* 1 IVF / *in vitro* fertilisation **;** 2 hormone(s) / FSH / LH, to stimulate (super)ovulation **;** 3 *idea of in vitro*, fertilisation of eggs / production of embryos **;** 4 embryo transfer / introduce embryo, to uterus **;** 5 *ref. to* surrogacy **;** 6 **and** 7 AVP **; ;** e.g. artificial insemination / AI same / related species *ref. to* embryo screening *ref. to* outbreeding for genetic diversity *ref. to* frozen ova / semen / embryos / frozen zoo, for, future use / as a gene bank	**4**

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Question	Answer	Marks
7(c)(i)	correct working ; [33 × 46] ÷ 9 (=168.7) 169 ;	2
7(c)(ii)	*any **three** from:* 1 (large / flightless so) easy to, mark / catch ; 2 (cockroaches) are mobile ; 3 no migration ; 4 constant / large, population size ;	3

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)</td><td>
<table>
<tr><th>function</th><th>part of seed</th><th></th></tr>
<tr><td>gibberellin synthesis</td><td>embryo</td><td>;</td></tr>
<tr><td>starch store</td><td>endosperm</td><td>;</td></tr>
<tr><td>amylase synthesis</td><td>aleurone layer</td><td>;</td></tr>
<tr><td>maltose production</td><td>endosperm</td><td>;</td></tr>
</table>
</td><td>4</td></tr>
<tr><td>8(b)(i)</td><td>any three from:

1 protons / H^+ ions, pumped / actively transported (into cell wall) ;

2 (so) pH (in cell wall) decreases / (cell wall) becomes more acidic ;

3 expansins, activated / AW ;

4 microfibrils (in cellulose) loosen (to allow elongation) ; Ignore weaken</td><td>3</td></tr>
<tr><td>8(b)(ii)</td><td>any three from:

1 K^+ / potassium ions, enter, cell / cytoplasm ; R active transport

2 water potential of, cell / cytoplasm, decreases
or
water potential of the cell wall increases ;

3 water enters (cell through aquaporins) by, osmosis / down the water potential gradient ;

4 cell volume increases / cell expands / increase in turgor pressure (inside cell) ;</td><td>3</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>
any four from:
<table>
<tr><th></th><th>structure</th><th>function in respiration</th><th></th></tr>
<tr><td>1</td><td>outer membrane</td><td>permeable for (diffusion of), oxygen / carbon dioxide / pyruvate / reduced NAD</td><td>;</td></tr>
<tr><td>2</td><td rowspan="2">inner membrane</td><td>site of, chemiosmosis / oxidative phosphorylation</td><td>;</td></tr>
<tr><td>3</td><td>(forms) cristae / is folded, to provide, large / increased, surface area
or
(has) many, electron transport chains / ETCs / electron carriers / ATP synthase (molecules)</td><td>;</td></tr>
<tr><td>4</td><td>intermembrane space</td><td>ref. to setting up proton gradient / high concentration of protons</td><td>;</td></tr>
<tr><td>5</td><td>matrix</td><td>site of (enzymes in) the, Krebs cycle / link reaction</td><td>;</td></tr>
<tr><td>6</td><td>DNA</td><td>codes for, (named) proteins / ribosomes / RNA</td><td>;</td></tr>
</table>
</td><td>4</td></tr>
<tr><td>9(b)</td><td>
any three from:

1 idea that more active the cell means more mitochondria ;

2 idea that heart muscle (cell) contraction needs lots of ATP ;

3 liver cell carries out, glycogenolysis / glycogenesis / gluconeogenesis / deamination / detoxification, so needs ATP ;

4 idea that red blood cells need room for haemoglobin ;
</td><td>3</td></tr>
</table>

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Question	Answer	Marks
9(c)	*any **three** from:* 1 glucose phosphorylated by ATP to form fructose (1,6-)bisphosphate **;** 2 fructose (1,6-)bisphosphate splits into **two** molecules of, triose phosphate / TP **; R** hydrolysed 3 triose phosphate / TP, **oxidised** to pyruvate **; A** dehydrogenated 4 ATP / reduced NAD, produced **;**	**3**

Question	Answer	Marks
10(a)	*any **four** from:* 1 electrons emitted (from chlorophyll) **; A** electrons excited 2 electrons pass along, electron transport chain / ETC, releasing energy **;** 3 (energy is used to) pump protons into thylakoid space **;** 4 *ref. to* proton gradient **;** 5 protons pass through ATP synthase into stroma **;** 6 ATP produced from ADP and Pi **;**	**4**
10(b)(i)	ribulose bisphosphate **;** triose phosphate **;**	**2**
10(b)(ii)	causes reduction **; A** reduced NADP is oxidised (so) converts GP to TP **;**	**2**
10(b)(iii)	amino acid **; Ignore** proteins	**1**

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Question	Answer	Marks
10(c)	1 carbon dioxide <u>concentration</u> is the limiting factor when, rate is increasing / AW ; 2 as graph levels off another factor becomes limiting ; 3 temperature / light intensity (become limiting) ; 4 AVP ; e.g. water shortage (closes stomata) causing low(er) <u>concentration</u> of carbon dioxide ;	3

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