CAMBRIDGE
International Education

# Cambridge International AS & A Level

**BIOLOGY** **9700/23**

Paper 2 AS Level Structured Questions **May/June 2026**

MARK SCHEME

Maximum Mark: 60

**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.



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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:<br><br>• the specific **content** defined in the mark scheme<br>• the specific **skills** defined in the mark scheme or in the level descriptions<br>• 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:<br><br>• marks are not deducted for errors or omissions<br>• 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<br>• 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<br><br>For questions that require ***n*** responses (e.g. State **two** reasons …):<br><br>• The response should be read as continuous prose, even when numbered answer spaces are provided.<br>• Any response marked *ignore* in the mark scheme should not count towards ***n***.<br>• Incorrect responses should not be awarded credit but will still count towards ***n***.<br>• 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.<br>• 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.<br>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 |
|---|---|
| CON | contradiction in response, mark not awarded |
| ECF | error carried forward applied |
| I | incorrect or insufficient point ignored while marking the rest of the response |
| IRRL | irrelevant material that does not answer the question |
| O | or reverse argument |
| PAG | point already given |
| R | incorrect point or mark not awarded |
| SEEN | point has been noted, but no credit has been given<br>or<br>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 |
| **bod** | allow benefit of doubt |

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| Question | Answer | Marks |
|---|---|---|
| 1(a)(i) | goblet (cell) **;** **R** globet | **1** |
| 1(a)(ii) | <u>smooth</u> muscle (tissue) **;** | **1** |
| 1(a)(iii) | **I** *ref. to* thickness of smooth muscle layer<br><br>*any **two** from*:<br>cartilage is present / (bronchiole) does not have cartilage **;**<br><br>chondrocytes are present / bronchioles do not have chondrocytes **;**<br><br>goblet cells are present / (smaller) bronchioles do not have goblet cells **;**<br>**A** bronchioles have (very) few goblet cells<br>**bod** higher proportion of / (relatively) more goblet cells<br>**bod** bronchioles do not have cell type **A ecf** from **1(a)(i)**<br>**R** bronchioles do not have ciliated epithelium, unqualified<br><br>AVP **;** e.g. epithelial cells in **Figure 1.1**, are pseudostratified / appear as more than one layer | **2** |
| 1(b)(i) | SA:V = 0.7 (: 1)**;**<br><br>*one of:*<br>surface area = $(2 \times (25 \times 8)) + (2 \times (25 \times 6)) + (2 \times (8 \times 6))$ ($\mu m^2$) **;**<br>796 / 1200 **;**<br>0.66333333 **;** | **2** |
| 1(b)(ii) | *any **two** from*:<br>*high SA:V is associated with*<br>increased / high / AW, <u>rate</u> of <u>diffusion</u> (of gases*)* **;**<br><br>allows diffusion / movement / AW, of, oxygen / carbon dioxide / respiratory gases **;** *in correct context of location / direction of movement*<br><br>flat / thin, cells<br>**or**<br>short / AW, diffusion distance **;** | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 2(a)(i) | prokaryotic cells are (usually) 1–5 μm (in length)<br>(**A** any value within the 1–5 range)<br>**or**<br>prokaryotic cells are smaller than, *P. myojinensis* / the cell in **Fig. 2.1 ;**<br><br>AVP **;** e.g. *suggestion that* (typical prokaryotic) cell contains plasmids<br>qualified *ref. to* periplasmic space | **1** |
| 2(a)(ii) | **I** endosymbionts<br><br>*any **two** from*:<br>ribosomes are, present in the nucleus of *P. myojinensis* /<br>not present in the nucleus of a eukaryotic cell **;**<br><br>*P. myojinensis* has only one nuclear membrane v a eukaryotic cell<br>has a nuclear envelope **;**<br>**A** double membrane / two nuclear membranes, *for envelope*<br>**A** does not have double membrane-bound organelles<br><br>named organelle, not present in *P. myojinensis* / present in a eukaryotic cell **;**<br>e.g. mitochondrion<br>(rough / smooth) endoplasmic reticulum<br>Golgi body<br>vesicles / vacuoles<br>nucleolus<br>chloroplast, *if qualified*<br><br>*P. myojinensis* has a cell wall **and** some eukaryotic cells do not have a cell wall **;** | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 2(a)(iii) | *any **two** from:*<br>*context is cell wall composition*<br>peptidoglycan / murein, so,<br>similar to, bacteria / prokaryotes<br>different to, eukaryotes (with cell walls) / plants / fungi **;**<br><br>cellulose / chitin, so,<br>similarity to eukaryotes **bod** plants / fungi<br>difference to, bacteria / prokaryotes **;**<br><br>AVP **;** e.g. mannan and glucan similarity to eukaryotes<br>*ref. to* composition of Gram negative bacterial cell walls<br>no, peptidoglycan / murein, could be similar to, Archaea / archaeans, which are prokaryotes | **2** |
| 2(b) | use (stage) micrometer to, work out / estimate / AW, length / number of micrometres, per, eyepiece / graticule, division **;**<br>**A** calibrate the eyepiece graticule with a stage micrometer<br><br>convert number of (eyepiece graticule) divisions (along cell length) to micrometre measurement / AW **;** | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 3(a) | **I** strong bonds<br>(hydrogen bonding allows) cohesion / attraction / AW, between<br>water molecules **;** AW<br>**A** water is cohesive **bod** water molecules are sticky<br>*in context of specific heat capacity or latent heat of vaporisation*<br><br>(provides) high specific heat capacity **and** high latent heat of vaporisation **;**<br>**bod** increases *for high*<br><br>(so) *idea of* resists changes in temperature **;** e.g.<br>a lot of energy required to break H–bonds, so water remains at a (relatively) constant temperature<br>a lot of energy required to increase water temperature<br>slow to change when temperatures change<br>prevents short-term temperature fluctuations<br>**bod** acts as a temperature buffer<br><br>(so) more / lots of / AW, energy required to, change liquid water into water vapour **/** evaporate water **;**<br>*context is latent heat of vaporisation*<br><br>AVP **;** e.g. example to support | **3** |

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| Question | Answer | Marks |
|---|---|---|
| 3(b) | *any **three** from*:<br><br>*context is xylem wall*<br>(hydrogen bonding gives) adhesion between water (molecules) and cellulose **;**<br>(hydrogen bonding gives) adhesion between water (molecules) and hydrophilic parts of lignin **;**<br><br>*if **mp1** and **mp2** not gained allow one mark for adhesion between water molecules and hydrophilic parts of xylem wall*<br><br>*context is flow of water in xylem*<br>adhesion, prevents column of water collapsing / helps water to move up against gravity**; R** adhesion to lignin<br><br>*hydrogen bonding gives cohesion between water molecules, so*<br>allows a, continuous / unbroken, column (of water)**;** AW<br>**A** *ref. to* transpiration stream *in correct context*<br><br>transpiration pull / *idea of* water moving up creates tension **;**<br>**A** water pulled up by, transpiration / evaporation / (overall) water potential gradient<br><br>*if no marks gained, allow one mark for ref. to cohesion-tension or cohesion **and** adhesion* | **3** |

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(c)</td><td>three marks:<br>W = thymine<br>X = adenine ;<br><br>Y = cytosine<br>Z = guanine ;<br><br>all spellings correct ;<br><br>or<br>two marks<br>purines and pyrimidines incorrect, but still correct base pairs with correct number of H bonds ;<br>all spellings correct ;<br><br>or<br>one mark<br>purines and pyrimidines and H bonds incorrect, but still correct base pairs and all bases named and spelled correctly ;</td><td>3</td></tr>
<tr><td>3(d)</td><td>one mark each correct row ;<br><br><table><tr><th>interaction</th><th>primary structure</th><th>secondary structure</th><th>tertiary structure</th></tr><tr><td>hydrogen bonds</td><td></td><td>✓</td><td>✓</td></tr><tr><td>hydrophobic interactions</td><td></td><td></td><td>✓</td></tr><tr><td>ionic bonds</td><td></td><td></td><td>✓</td></tr></table><br>if no marks gained mark columns to max 2</td><td>3</td></tr>
</table>

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| Question | Answer | Marks |
|---|---|---|
| 4(a) | transmissible **;**<br>**A** communicable<br>**I** contagious<br><br>pathogen **;** | **2** |
| 4(b) | **bod** *abbreviations 1º, 2º, 3º, 4º, for the levels of protein structure*<br><br>*any **four** from*:<br>primary structure (of each polypeptide) has, amino acid with sulfur in R–group / cysteine **;** AW<br>**bod** *ref. to* sequence of amino acids *for primary structure*<br><br>secondary structure with, alpha helices / α–helices **; R** beta-pleated sheets<br><br>tertiary structure, qualified **;** e.g. folded / coiled held in shape by R-group interactions / two named<br><br>*idea of* tertiary structure / active site / polypeptide chain **A**, has specific shape (complementary to substrate) **;**<br>**A** *ref. to*, binding site / specific catalytic site (in region of enzyme activity) *instead of active site*<br><br>quaternary structure has, two / 2, polypeptides / subunits **;**<br><br>further detail **;** e.g.<br>secondary structure with, areas of random coils<br>*quaternary structure* disulfide bond / S–S (covalent bond), joins the two polypeptides<br>(*tertiary / quaternary*) globular<br><br>AVP **;** e.g. zinc ion is, prosthetic group / cofactor<br>**A** *ref. to* part of quaternary structure | **4** |
| 4(c) | endocytosis **; bod** phagocytosis | **1** |

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(d)</td><td>
<table>
<tr><th>description</th><th>types of immunity</th></tr>
<tr><td>Antibodies against tetanus toxin are passed from the mother to the fetus during pregnancy.</td><td>natural<br>and<br>passive ;</td></tr>
<tr><td>Inactivated tetanus toxin can be injected into a person.</td><td>artificial<br>and<br>active ;</td></tr>
<tr><td>Anti-tetanus antibodies are injected into a person who has been exposed to C. tetani.</td><td>artificial<br>and<br>passive ;</td></tr>
</table>
A in either order for each example (i.e. ‘passive and natural’, ‘active and artificial’ and ‘passive and artificial’)</td><td>3</td></tr>
<tr><td>4(e)</td><td>F first <u>and</u> B second ; max 1 mark if this mp not gained<br>C before A ;<br>E before D ;</td><td>3</td></tr>
<tr><td>5(a)</td><td>any two from:<br>(H because) it is closed / blood is (transported) in blood vessels (and heart) / blood cannot leave the system ;<br><br>(because) it, passes through the heart twice (in one complete circuit) / is double circulation ;<br><br>(because) it, shows pulmonary and systemic, circulations / circuits ;<br><br>If letter J given as the answer, allow one mark for ‘closed’.<br>R (letter) G</td><td>2</td></tr>
</table>

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| Question | Answer | Marks |
|---|---|---|
| 5(b) | *any **four** from*:<br>(at arteriole end of capillary) high, hydrostatic / blood, pressure **;**<br><br>(pressure / ultra) filtration (of blood) **;**<br><br>plasma / water and solutes / fluid, leave / AW, blood / capillaries **;**<br>**R** diffusion<br><br>glucose / amino acids / ions, (filtered) out **;**<br><br>(large) plasma proteins, remain / not filtered out **;**<br><br>*ref. to* endothelial pores / fenestrations / fenestrae<br>**or**<br>pores / gaps / spaces, in, capillary wall /endothelium / between (endothelial) cells **;**<br><br>AVP **;** e.g. hydrostatic pressure of blood is greater than hydrostatic pressure of tissue fluid (at arteriole end of capillary) | **4** |

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| Question | Answer | Marks |
|---|---|---|
| 5(c) | *allow ecf if symplast and apoplast pathway are not named but are incorrectly assigned*<br><br>*any **five** from*:<br><br>*symplast pathway*<br>water enters, root hair cell / epidermal cell, by osmosis (across cell surface membrane) **;**<br><br>water movement through cytoplasm (of cells) **;**<br><br>*ref. to* vacuolar pathway **;**<br>**A** described e.g. crosses tonoplast of vacuole(s)<br>enters / leaves, vacuole(s) by osmosis<br><br>water movement to adjacent cells via plasmodesmata **;** AW<br><br>*apoplast pathway*<br>cell wall route **;**<br><br>further detail **;** e.g. between, cellulose fibres / spaces between cells / intercellular spaces<br><br>*at endodermis*<br>enters cells when endodermis reached / moves into symplast pathway at endodermis **;**<br><br>*ref. to* blocked by, suberin / Casparian strip (at endodermis) **;**<br><br>AVP **;** e.g. correct sequence of, cell / tissue, pathway<br>*three of the four of*<br>epidermis / epidermal cell / root hair cell<br>to, cortex / cortical cells / parenchyma cells<br>to, pericycle<br>to, endodermis / endodermal cell | **5** |

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| Question | Answer | Marks |
|---|---|---|
| 6(a) | ligase joins / AW, Okazaki fragments / fragments on lagging strand / AW **;**<br><br>catalyses, formation of phosphodiester bonds **;**<br>*to join, Okazaki / DNA fragments*<br><br>*plus max 2 from:*<br>lowers / AW, activation energy **;**<br><br>provides alternative reaction pathway **;**<br><br>(mode of action) lock and key / induced fit / formation of enzyme-substrate complex **;**<br>*allow described in terms of joining adjacent nucleotides* | **3** |
| 6(b) | $G_1$ **and** S **and** $G_2$ **; A** mentioned anywhere in the answer and in any order<br>**A** synthesis for S<br><br>*plus any **three** from*:<br><br>cell growth in $G_1$ and $G_2$ **; A** cell / cytoplasm volume, increases in size<br><br>(high levels of) protein synthesis / AW, in $G_1$ (and some protein synthesis in $G_2$)**;**<br><br>organelles replicate in, $G_1$ / $G_2$ / $G_1$ and $G_2$ **; A** examples e.g. mitochondria<br><br>DNA replication in S phase **; A** formation of, sister, identical, chromatids<br><br>centrioles, replicate / complete replication, in $G_2$ **;**<br>**A** procentriole formation / centrioles begin to form, in S phase<br><br>AVP **;** e.g. histone synthesis in $G_1$ / S, phase<br>$G_2$ phase increase in energy stores<br>$G_1$ checkpoint, qualified e.g. to proceed to S phase<br>$G_2$M, checkpoints occur / checkpoint before mitosis begins<br>**bod** DNA is checked before mitosis | **4** |
| 6(c)(i) | metaphase **;** | **1** |

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| Question | Answer | Marks |
|---|---|---|
| 6(c)(ii) | cell plate formation cell wall formation **;**<br>**A** spindle / spindle fibre, disassembly<br>**A** formation of cell surface membrane *in context of forming daughter cells*<br>**bod** cytokinesis | **1** |

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