CAMBRIDGE
International Education

Cambridge International AS & A Level

BIOLOGY **9700/24**

Paper 2 AS Level Structured Questions **October/November 2025**

MARK SCHEME

Maximum Mark: 60

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 October/November 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

PUBLISHED

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.

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	<u>'List rule' guidance</u> 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.

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.

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 standard isation 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

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 or blank page seen

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

Question	Answer	Marks
1(a)(i)	*explanation* semi-conservative replication / DNA replication / S phase, has occurred **;** **R** if replication stated to occur in, G_1 / G_2 **I** chromatin replicates *difference between chromatin in G1 and G2:* *(allow ecf from mp1 if stated replication occurs in G2)* *Any **one** from:* double the / doubling in, quantity / number / amount, of, chromatin / DNA **;** **A** chromatin has doubled sister / two identical, chromatids (formed, instead of one structure) **;** **A** two chromatids joined at the centromere (in G2) (each) chromosome with 1 DNA molecule (in G1) has 2 DNA molecules (in G2) **;** *allow double, helix/ helices for molecule(s)* *treat as neutral ref. to chromatin / chromosome, state / behaviour* *e.g. decondensed / diffuse*	**2**

Question	Answer	Marks
1(a)(ii)	*any **three** from*: *check diagram to see if points can be awarded* description of nucleus as having any **two** listed structures **;** two from: nuclear envelope, nuclear pore(s), nucleolus, nucleoplasm *correct spelling* detail of nuclear envelope **;** e.g. two membranes / double membrane *accept from diagram* encloses / protects, chromatin / DNA / chromosomes / genetic information / genetic material outer membrane continuous with rough endoplasmic reticulum outer membrane with ribosomes (on outer surface) controls exit and entry of substances *if nuclear envelope not stated,* **A** the nucleus is surrounded by a double membrane **or** a double membrane encloses, chromatin / AW **or** (it is) double-membrane bound / bound by a double membrane detail of nuclear pore(s) **;** e.g. allows (m)RNA to, pass through / leave / AW (nucleus) allows ribosomal subunits to leave (nucleus) allows entry of proteins prevents exit of DNA (small) channel / passage, through the nuclear envelope *can be shown on a diagram, with a label* detail of nucleolus **;** e.g. spherical *can be shown as circle on diagram, labelled nucleolus* one / can be more than one synthesis of, rRNA / ribosomal subunits **A** ribosomes densely staining / dense region / condensed region *allow shaded in on a diagram, labelled nucleolus* AVP **;** e.g. nucleoplasm is fluid surrounding chromatin	**3**

Question	Answer	Marks
1(b)(i)	**R** *the mp if feature of cellulose stated and, is incorrect / is not neutral* *for mps 1, 3, 4 can accept 'cellulose does not have ..'* *any **four** from*: *starch has* **1** (monomer of) alpha glucose / α-glucose / α-1,4 (glycosidic) bond **;** **I** glucose / glycosidic bond / 1, 4 bond *(all shared with cellulose)* **2** monomers / glucose, orientated the same way / AW **;** **ora** for cellulose i.e. monomers rotated 180° to each other **I** cellulose / cellulose molecule, rotates 180° **3** made of, two different polysaccharides / two different polymers / amylose and amylopectin **;** **4** amylopectin / starch, has (α-1,4 and) α-1,6 (glycosidic) bonds **;** **A** 1-6 *if alpha noted elsewhere* **A** link / linkage, for bonds **R '**can have α-1,4 or α-1,6 bonds' **5** amylose, helical / coiled **R** α-helix **or** amylopectin branched **;** *if both are stated, allow mp3 as well* **A** starch, is branched / has branching (v cellulose, not branched / linear) **R '**starch can be helical or branched' **6** no, hydrogen / H, bonds, to hold together / between / AW, molecules / polysaccharides **;** **A** cellulose has ……. **7** AVP **;** e.g. forms, starch, grains / granules **A '**cellulose does not have ..' does not have microfibrils / fibrils / fibres **A** 'cellulose has..'	**4**

Question	Answer	Marks
1(b)(ii)	**1** (different) mAbs have, different / specific, antigen binding sites / variable regions **;** **I** active site **2** (each) mAb has complementary shape for, binding / AW, antigen (combining with / attaching to) **or** mAbs are / a mAB is, specific / complementary, to particular, antigen(s) **;** **3** *idea that* a (particular) pectin / RG-I , has different, shapes / conformations / antigens, in its structure **;** **4** *idea of* (using) different / specific, (sets / combinations, of) mAbs to, recognise / identify / locate / use for, different pectins / types of RG-I / a particular RG-I **;** **5** *ref. to* studying development e.g **;** changes occurring / side chains added, during development need different mAbs some mAbs may be specific to side chains not yet added can help to show when modifications occur **6** AVP **;** e.g. reason to use more than one mAB • some mAbs may bind to more than one type of pectin • other cell wall components, may have, similar structures / same side chains • some areas of RG-I may be out of reach for a specific mAb • can, obtain information about / investigate, shape / structure of the particular pectin	**3**

Question	Answer	Marks
2(a)	cholera = prokaryotic and malaria = eukaryotic and TB = prokaryotic **;**	**1**
2(b)	pathogen **;**	**1**

Question	Answer	Marks
2(c)(i)	*magnification* (x) 12 000 **;;** *for line X-Y measuring 24 mm* **A** *calculated values for line X-Y measured between 23 to 25 mm* *for one mark:* • *correct calculation for 23.5 or 24.5 but not to 3 sig. figs = 1 mark* • *incorrect answer e.g. conversion factor incorrect, but* – *shows correct measurement for image* – *uses correct formula for calculation* – *answer to 3 sig. figs* • *measurement 22 mm or 26 mm* – *correct answer for their measurement* – *uses correct formula for calculation* – *answer to 3 sig. figs*	**2**
2(c)(ii)	*any **three** from:* **1** by a vector / carrier / mosquito / insect / (female) *Anopheles* **;** **2** takes, blood meal / sucks blood / feeds on blood **;** *context is transmission from infected to uninfected* **3** *Plasmodium* / pathogen / parasite, is in blood **;** *in correct context* **4** injects *Plasmodium* / AW, together with, anticoagulant / saliva **;** **5** AVP **;** e.g. *Plasmodium* / AW, migrates, after ingestion / from insect gut / AW, to salivary glands *if another mode of transmission stated, e.g. transfusion, allow mp1 and mp3 and a relevant AVP*	**3**

Question	Answer	Marks
2(d)(i)	*any **two** from:* (phagocyte) has (specific) receptors (for PS) **;** **R** antigens **A** named e.g. macrophage / monocyte / Kupffer cell / neutrophil PS binds to (phagocyte / cell surface) receptor (to stimulates a response) **;** **A** phagocyte has a binding site for PS / PS binds to a binding site *ref. to* (PS presence / change in membrane) causes chemotaxis / attracts phagocyte (to red blood cell) *treat as neutral suggested chemicals that trigger chemotaxis* AVP **;** e.g. PS acts as an antigen	**2**
2(d)(ii)	*any **one** from:* *why uninfected red blood cells are destroyed* (some) PS is present in outer layer so can be, recognised / detected **;** AW *why only some red blood cells are destroyed* only a few PS in outer layer so lower chance of being recognised **;** parts of, parasite / pathogen / *Plasmodium* (in circulation), may become attached to, surface / cell surface membrane **;** (cell) displays, a foreign antigen / a non-self, antigen **;** displays an antibody (attached to antigen) **;** damaged (by other means) / at end of life-span / non-functioning, (so need destroying) **;**	**1**
2(e)(i)	**R** if context is, red blood cell / entry into red blood cell by pathogen any ***one*** from: *context is Plasmodium* for, cell membrane(s) / cell surface membrane **;** maintain / regulate, stability / fluidity, of membrane **;** **I** affects / changes, *if not qualified* **A** phospholipid bilayer *for membrane* to, convert / AW, to other products needed **;** to (breakdown and) use as an energy source **;** cannot / does not have gene to, synthesise cholesterol **;** AVP **;** e.g. to form, vesicle / vacuole (to contain replicated cells)	**1**

Question	Answer	Marks
2(e)(ii)	**I** *ref. to* temperature *any **two** from:* **1** make more fluid / increase fluidity **;** **2** decrease / reduces, membrane stability **;** **3** increases, entry / exit, of, polar molecules / ions / water **;** **A** increases, permeability / described **4** allow increased (lateral) movement of cell components within bilayer **;** **5** reduced interaction with fatty acid tails **;** **6** AVP **;** e.g. decreased interaction with proteins, so affecting their function may affect ability to distort shape when passing through capillaries *if no marks gained, allow one compensation mark for* • *changes two of: fluidity / stability / permeability* • ***ecf** from 'decreases fluidity'*	**2**
2(f)(i)	*any **one** from*: active / energy-requiring, process **;** **A** need energy, for the process / to move phospholipids moving, phospholipids / named, against the concentration gradient / to area with higher quantity / AW **;** to allow conformational change (of enzyme) **;** **I** active transport but **R** if described as movement across the membrane	**1**
2(f)(ii)	*any **one** from*: actively transport / pump, Ca^{2+} / calcium ions, out of cell (once entered) **;** transports Ca^{2+} / calcium ions, (out) against the concentration gradient **;** cell surface membrane impermeable to, Ca^{2+} / calcium ions **;** no / very few, transport / pump / carrier / channel, (membrane) proteins **;** *context is for entry of calcium ions*	**1**

Question	Answer	Marks
2(f)(iii)	*any **three** from:* **1** scramblase, activated / becomes active / begins functioning / AW **;** *context is, increase in Ca^{2+} / when Ca^{2+} binds* **A** Ca^{2+} increases, more scramblase binds to Ca^{2+} **ora** scramblase, suppressed / inactive (only), in low Ca^{2+} concentration **2** scramblase moves, PC from outer to inner layer **or** PE / PS, from inner to outer layer **;** **I** scramblase randomly moves, PC / PE / PS **3** described effect on, distribution / organisation / asymmetry / AW (of phospholipids in cell surface membrane) **;** e.g. becomes, disrupted / disorganised / more random is uncontrolled / not regulated becomes more, symmetrical / even / evenly balanced higher proportion of, PC in inner layer higher proportion of, PE / PS, in outer layer (than normal) *(idea that the phospholipids are in the incorrect location)* **4** scramblase activity higher than activity of, flippase / floppase **or** *idea that,* flippase / floppase, action cannot counteract effect of scramblase **;** **5** ATP runs out, qualified **;** e.g. to maintain asymmetry for (increased), flippase / floppase, activity to move phospholipids (against their gradient) **6** AVP **;** e.g. Ca^{2+} is, a cofactor / needed for scramblase function	**3**

Question	Answer	Marks
3(a)(i)	*if DNA or thymine stated within response, allow <u>only</u> H-bond mark (**ecf**)* *any **two** from:* (paired section) contains, complementary nucleotides / complementary bases / base pairs **;** adenine-uracil <u>and</u> guanine/cytosine **; A** A/U and G/C (paired by) hydrogen / H, bonds **; I** strong (bonds) **ecf** from mp1 **R** if another bond also named **I** phosphodiester bonds between, adjacent / AW, nucleotides	**2**
3(a)(ii)	*any **two** from:* (enzyme / Drosha / Dicer) active site is specific (to site on dsRNA) **;** *can apply in context of specific shaped active site or active site specific to a particular location* detail of different active sites of Drosha and Dicer **;** site to be cleaved / AW, (only), fits into / can bind with / is complementary to (the specific) active site forms enzyme-substrate complex at a particular site Drosha and Dicer require different, conditions / cell locations, to function **;** AVP **;** e.g. *suggestion that* Dicer too large to enter nucleus Drosha exposed to degradation in cytoplasm	**2**

Question	Answer	Marks
3(b)	*any **two** from:* mRNA is single-stranded <u>and</u> siRNA is double-stranded **;** **A** polynucleotide / chain, for strand siRNA has paired and unpaired nucleotides **or** mRNA has, only unpaired nucleotides / no base pairing **;** mRNA codes for a, sequence of amino acids / protein **; ora** for siRNA mRNA has a longer sequence of nucleotides **;** **A** mRNA, is longer / has more nucleotides AVP **;** e.g. *ref. to* siRNA antiparallel / mRNA only 5' to 3' mRNA has no H bonds	**2**
3(c)(i)	*any **one** from:* RISC must, align with / attach to / form H bonds with, (target) mRNA **;** (passenger strand needs to be, separated / released) to allow guide strand to, be exposed / bind to mRNA **;** AW **ora** e.g. (otherwise) guide strand cannot bind to mRNA passenger strand prevents guide strand binding guide strand has complementary sequence to target sequence of mRNA **;** **ora** passenger strand does not ….	**1**

Question	Answer	Marks
3(c)(ii)	*allow protein for polypeptide* *points need the correct context of cleaved mRNA* *any **three** from:* *no protein formed* **1** *idea that* mRNA may be degraded in cell before attaching to ribosome **;** **2** mRNA may not (be able to) attach to ribosome so no, polypeptide formed / translation **;** **3** cleaved mRNA results in loss of start, sequence / codon **;** *abnormal polypeptide formed* **4** polypeptide chain is not released from ribosome **;** **A** cleaved mRNA results in loss of stop codon **5** polypeptide chain degraded within cytoplasm / AW **;** **6** cleaved mRNA results in short(er) (polypeptide) chain being produced **;** **7** polypeptide does not, fold up / form correct tertiary structure / form correct 3D shape **; I** tertiary structure changes **8,9** AVP **;** e.g. (results in) different R-group interactions / change in number of bonds that can form active site / site of activity, changed / lost	**3**

Question	Answer	Marks
4(a)	bronchus **;**	**1**
4(b)(i)	alveolus **;** **A** alveolar sac / alveolar duct	**1**
4(b)(ii)	<u>smooth muscle</u> (cell) **;**	**1**
4(b)(iii)	*any **three** from:* no cartilage **;** **A** no, cartilage rings / C-shaped cartilage **A** no, irregular cartilage / cartilage plates few / no, goblet cells **; ora** trachea / bronchus, have (more) goblet cells thin layer / patches / areas, of smooth muscle **; ecf** from (b)(ii) **A** idea of quantity of smooth muscle less (than in, trachea / bronchus) thin(ner) wall **;** (more) convoluted / wavy, lumen lining **;** AW e.g. folded / curvy **A** lumen lining not smooth less, elastic, tissue / fibres, (than, trachea / bronchus) **;** AVP **;** e.g. ciliated epithelium not, pseudostratified / layered appearance *in context of the trachea / larger bronchi* no mucous glands present	**3**

Question	Answer	Marks
4(c)	*any **two** from:* *allow O_2 for oxygen and CO_2 for carbon dioxide* systemic circulation (needed) to bring, oxygen / glucose, and pulmonary circulation brings deoxygenated blood **;** *idea that* lungs are location, of gas exchange (surface) / where absorption of oxygen occurs / where excretion of carbon dioxide occurs **or** pulmonary circulation for, oxygen uptake / carbon dioxide excretion **;** cells need, oxygen / glucose, for (aerobic) respiration / for cell metabolism / AW **;** **R** body cells	**2**

Question	Answer	Marks
5(a)(i)	microtubules **;**	**1**
5(a)(ii)	*any **two** from:* *ref. to* (daughter) chromosomes at poles **;** **R** move to poles **I** ends **A** (sister) chromatids at poles **A** two separate groups of (daughter) chromosomes **A** two nuclei form (enclosing chromosomes) **I** there are two nuclei **R** if in context of cell dividing *in context of at each pole, so* **R** *if context implies only a single nucleus* nuclear envelope, reassembles / (re-)forms / AW (around chromosomes) **;** **A** nuclear membranes reassemble nucleolus / nucleoli, reappear(s) / re-form(s) **;** (daughter) chromosomes, become diffuse / become long and thin / decondense / uncoil **;** **A** become chromatin **I** chromosomes disappear spindle, disassembles / AW **;** **A** spindle breaks down *accept ref. to microtubules in a correct context*	**2**

Question	Answer	Marks
5(b)	*any **three** from:* two structural features named **;** valves *do not count as a feature if described as semilunar* tunica, externa / adventitia **A** outer layer with collagen tunica media **A** middle layer with smooth muscle and elastic tissue thin wall large lumen (relative to wall thickness) *feature matched to function* *valve **I** semilunar* to, prevent backflow / help blood move back towards the heart / help move blood in one direction **;** *tunica, externa / adventitia* contains collagen / thick(est) layer / outer layer, to protect / prevents collapse (from external forces) / helps to maintain shape **;** AW *tunica media* smooth muscle, for (mechanical) support / to change diameter of lumen / to help move (low / zero, pressure) blood back towards heart **;** elastic fibres to accommodate changes in, blood volume / lumen diameter **;** **A** allows, vein / blood vessel, to, stretch / recoil **R** stretch and recoil to prevent bursting *thin walls with large lumen* holds large(r), volume / quantity / amount, of (low / zero, pressure) blood **I** more blood **or** (large lumen) *ref. to* minimises / reduces, resistance (from walls) **;**	**3**

Question	Answer	Marks
6(a)	*any two features for sink = 1 mark* leaf is a sink when it is growing it is, immature / young / developing / new **A** before it is mature it is not (yet) photosynthesising / cannot make its own sugars / cannot make its own organic compounds / named receives, assimilates / photosynthates / organic compounds / named it needs energy(-containing compounds) *any two features for source = 1 mark* leaf is a source when it is mature / not young / developed photosynthesising / synthesising assimilates / AW translocating assimilates / described e.g. provides assimilates / named, to, other parts of the plant / sinks **I** starch if other correct named, otherwise **R** *one mark if only 1 correct feature for sink and 1 correct feature for source*	**2**
6(b)	**B** = 2 **;** **C** = 4 **;** **D** = 3 **;** **E** = 1 **; A** 2 **A** 1 and 2	**4**