

INTERNATIONAL A-LEVEL **BIOLOGY (9610)**

BL04

Unit 4 Control

Mark scheme

June 2026

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the typical answer or answers which are expected
- extra information to help the examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit.

The extra information in the 'Comments' column is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme. At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for the same mark are indicated by the use of **OR**. Different terms in the mark scheme are shown by a/; eg allow smooth/free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of errors/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (often prefaced by 'Ignore' in the 'Comments' column of the mark scheme) are not penalised.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can usually be gained by correct substitution/working and this is shown in the 'Comments' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward, consequential marking and arithmetic errors

Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ECF or consequential in the mark scheme.

An arithmetic error should be penalised for one mark only unless otherwise amplified in the mark scheme. Arithmetic errors may arise from a slip in a calculation or from an incorrect transfer of a numerical value from data given in a question.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.6 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.7 Ignore/Insufficient/Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded

Question	Marking guidance	Mark	Comments
01.1	1. Binds to (specific) receptors on (liver/muscle) cells; 2. Activates (glucose) carrier proteins / opens (glucose) channel proteins OR Causes (glucose) channel/carrier proteins to form; 3. Glucose moves/diffuses into cells (and decreases blood glucose concentration); 4. (Insulin causes) glucose to be converted to glycogen OR (Insulin causes) glycogenesis;	4	2. Do not allow reference to 'active site(s)' 3. Allow increases the permeability of (liver/muscle) cells/tissues to glucose 4. Allow causes formation of fatty acids/lipid/fat (from glucose) 4. Allow causes increase in rate of respiration in cells 4. Do not allow if any reference to 'glycogenolysis'

Question	Marking guidance	Mark	Comments
01.2	1. Food (recently) eaten would increase blood glucose concentration; 2. Idea of giving a baseline measurement (that allows comparison);	2	1. Allow idea that increase in blood glucose concentration is due to the test glucose only (not previous meals) 2. Idea that insulin secretion will be low;

Question	Marking guidance	Mark	Comments
01.3	<p>1. Patient B (likely) has diabetes OR Patient B is unable to control blood glucose concentration;</p> <p>2. As blood glucose concentration is higher at start OR As blood glucose concentration is higher after 2 hours / does not return to same/below concentration at start;</p>	2	1. Ignore references to type 1 or type 2

Question	Marking guidance	Mark	Comments
01.4	<p>Any one from:</p> <ul style="list-style-type: none"> • Requires fasting / not eating for several hours • Only one measurement taken after two hours / no repeated measurements / measurements not taken at intervals • Takes (at least) two hours to complete • Measurements are sensitive to day-to-day variations due to diet/exercise/stress • Measurements may vary depending on the time of day of testing; 	1	

Total		9	
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Question	Marking guidance	Mark	Comments
02.1	1. Heart rate decreases (during the dive), stays low (when underwater) and then increases (when resurfacing); 2. Reference to small fluctuations in heart rate (when underwater) OR Reference to heart rate higher after the dive than at the start;	2	Allow 2 marks for correct description and use of data e.g. heart rate starts at approx. 100, drops to below 10 during the dive and then rises to approx. 140-150 at end

Question	Marking guidance	Mark	Comments
02.2	1. (Reduced heart rate leads to) lower oxygen consumption; 2. Allows the seal to stay submerged for longer time (to find food) OR Allows the seal to dive deep(er) (to find food);	2	1. Allow idea of conserving oxygen during the dive

Question	Marking guidance	Mark	Comments
02.3	(Increase in carbon dioxide concentration causes:) 1. Decrease in (blood) pH detected by <u>chemoreceptors</u> (in carotid arteries / aorta / medulla oblongata); 2. Increased (frequency of) <u>impulses</u> ; 3. To the <u>sinoatrial node/SAN</u> (that causes increase in heart rate);	3	2. Reduced parasympathetic impulses 3. Ignore reference to pacemaker

Total		7	
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Question	Marking guidance	Mark	Comments
03.1	1. (Pressure causes) membrane/lamellae/layers to deform/stretch; 2. Sodium ion channels open and sodium ions diffuse in; 3. Causes depolarisation (leading to generator potential);	3	2. Reference to ions needed just once 2. Allow Na ⁺ but do not allow Na 2. Allow reference to movement down a concentration gradient (for diffusion) 2. Do not allow movement/diffusion into the membrane

Question	Marking guidance	Mark	Comments
03.2	1. D causes insufficient sodium ion channels to open OR D causes insufficient sodium ions to enter OR D + D / D + E causes more/enough sodium ion channels to open OR D + D / D + E causes sufficient sodium ions to enter; 2. Threshold not met (with pressure) from D OR Threshold met (with greater pressure) from D + D/D + E ; 3. D causes no action potential (to be generated) OR D + D / D + E causes an action potential (to be generated);	3	1. Allow one mark for: D + D is temporal summation OR D + E is spatial summation

Question	Marking guidance	Mark	Comments
03.3	<p>1. Peak of action potential/depolarisation/membrane potential is lower OR Depolarisation shows less change from resting potential;</p> <p>2. Duration of action potential is longer;</p> <p>3. Resting/starting potential is less negative OR Resting/starting potential is less polarised;</p>	3	<p>Allow converse in context of neurone G</p> <p>1 – 3. Allow a comparison using figures</p>

Question	Marking guidance	Mark	Comments
03.4	<p>1. Sodium ion concentration gradient is less steep OR Lower concentration of sodium ions outside neurone;</p> <p>2. Less sodium/potassium ion channels;</p> <p>3. (Resting potential) maintained by a different type / less sodium-potassium pumps;</p>	2	<p>Allow the converse in context of G</p> <p>2. Allow F is less permeable to sodium ions OR slower opening of sodium ion channels</p> <p>Allow other ideas e.g.</p> <ul style="list-style-type: none"> F is not myelinated F has a narrower axon diameter

Total		11	
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Question	Marking guidance	Mark	Comments
04.1	A <u>growth</u> response to a directional stimulus OR A directional <u>growth</u> response to a stimulus;	1	Ignore reference to movement

Question	Marking guidance	Mark	Comments
04.2	1. Seeds/seedlings selected and water added; 2. (Position) seedlings so that the roots are horizontal; 3. Light excluded; 4. Control test with rotating seedlings; 5. Observation of direction/angle of growth (after suitable time period);	4	1. Allow use of agar instead of water 4. Allow use of clinostat

Question	Marking guidance	Mark	Comments
04.3	1. Statoliths puts more PIN proteins on the lower side of the cell; 2. (More) IAA transported out of cells (on the lower side); 3. IAA (accumulates on lower side of root and) inhibits (cell) elongation/growth;	3	2 - 3. Allow converse

Question	Marking guidance	Mark	Comments
04.4	1. Fewer statoliths/PIN proteins present on the salt side (of the root); 2. Less IAA transported out of cells (on the salt side) OR Lower IAA concentration on the salt side (of the root); 3. Less inhibition of (cell) elongation/growth (on the salt side) OR Greater (cell) elongation/growth (on the salt side);	3	1 – 3. Allow converse points for the non-salt side

Question	Marking guidance	Mark	Comments
04.5	1. (High salt concentration) lowers the water potential (in the soil); 2. Causes water to leave (the root) by osmosis/diffusion OR Causes less water to enter (the root) by osmosis/diffusion; 3. Less water reduces (turgor) pressure of plant cells OR Less water causes plant to wilt;	2	

Total		13	
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Question	Marking guidance	Mark	Comments
05.1	Hormones / named hormones (insulin, human growth hormone, cortisone, testosterone, oestrogen) OR Enzymes / named enzymes;	1	

Question	Marking guidance	Mark	Comments
05.2	3 = GTACA; 4 = CATGT;	2	Allow error carried forward from incorrect step 3

Question	Marking guidance	Mark	Comments
05.3	1. Zero/low/constant fluorescence until 18 cycles; 2. Increase and then levels off;	2	

Question	Marking guidance	Mark	Comments
05.4	$3.2 \times 10^9 = 3$ marks;;; 3, 221, 225, 500 = 2 marks;; $2^{28} / 268435460 \times 12 = 1$ mark;	3	Allow 2 marks for correct calculation plus standard form from incorrect number of cycles Allow 1 mark for correct calculation from incorrect number of cycles not in standard form

Question	Marking guidance	Mark	Comments
05.5	Reactants/named reactants (e.g. primers, nucleotides) are used up/limiting;	1	Do not allow DNA polymerase is used up/denatured
Total		9	

Question	Marking guidance	Mark	Comments
06.1	7500 = 2 marks;;	2	<p>Allow 7159 to 7826 (allows for 1 mm error in measurements)</p> <p>Allow one mark for correct answer but incorrect factor of 10 (error interconversion of units)</p> <p>OR</p> <p>Evidence of $22\,500 \div 3$</p>

Question	Marking guidance	Mark	Comments
06.2	<p>Any one from:</p> <ul style="list-style-type: none"> H-zone is wide; <p>OR</p> <ul style="list-style-type: none"> I-bands are wide; <p>OR</p> <ul style="list-style-type: none"> A band doesn't occupy (nearly) all of the sarcomere; <p>OR</p> <p>Myosin isn't as close to the Z lines;</p> <p>OR</p> <ul style="list-style-type: none"> Small(er) zone of overlap; 	1	<p>Allow descriptions of H-zone e.g. region with only thick filament/myosin or I-bands as regions with only thin filament/actin</p>

Question	Marking guidance	Mark	Comments
06.3	125 (%);	1	Allow range within 1 mm tolerance in measurements

Question	Marking guidance	Mark	Comments
06.4	<p>Any one from:</p> <ul style="list-style-type: none"> Idea of helping to return sarcomere back to relaxed state <p>OR</p> <ul style="list-style-type: none"> Extends/recoils to help return actin/myosin/protein filaments back to starting position <p>OR</p> <ul style="list-style-type: none"> Helps to increase the length of sarcomere / increase distance between Z-lines so sarcomere can then contract again <p>OR</p> <ul style="list-style-type: none"> Ensures sarcomere does not over-extend <p>OR</p> <ul style="list-style-type: none"> Helps to hold the myosin (filaments) in position; 	1	

Question	Marking guidance	Mark	Comments
06.5	<ol style="list-style-type: none"> Standard error and 95% confidence limits; Significant <u>difference</u> (between the two groups); Probability of the <u>difference</u> due to chance less than 0.001 / 0.1% <p>OR</p> <p>(Significant difference) as P value is less than 0.05;</p>	3	<ol style="list-style-type: none"> Allow (Student) t-test Allow null hypothesis is rejected <p>2. & 3. Do not allow reference to 'significant results' but only penalise once</p>

Question	Marking guidance	Mark	Comments
06.6	<p>(Mice with CT1 mutation:)</p> <ol style="list-style-type: none"> 1. Produce (significantly) less creatine; 2. Less able to make phosphocreatine <p>OR</p> <p>Less phosphate would be available to reform ATP;</p> <ol style="list-style-type: none"> 3. Less ATP available so weaker force of contraction; 	3	
Total		11	

Question	Marking guidance	Mark	Comments
07.1	Enzyme: amylase; Product: (alpha) glucose / maltose;	2	

Question	Marking guidance	Mark	Comments
07.2	Lower starch index needed for longer term storage;	1	Allow converse

Question	Marking guidance	Mark	Comments
07.3	Lower starch index means the fruit is less ripe and can be stored for longer;	1	Allow converse

Question	Marking guidance	Mark	Comments
07.4	1. (Fruits stored/transported when unripe/hard so) avoids damage/decay; 2. Fruits are ripened when required/when they reach destination so they are softer/edible/better taste/sweeter;	2	

Question	Marking guidance	Mark	Comments
07.5	1. (Increase in the rate of) respiration produces (more) ATP; 2. (ATP) needed for enzyme synthesis / pigment production;	2	

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Question	Marking guidance	Mark	Comments
07.6	1. Similar structure/shape (to ethene); 2. Able to bind to (same) receptors; 3. Causes expression of gene(s) for enzymes involved in ripening;	3	1. Do not allow 'same structure/shape' 2. Allow 'attach to (same) binding sites' e.g. in the context of transcriptional factors; 3. Allow descriptions of 'expression' e.g. transcription / 'switch on'

Question	Marking guidance	Mark	Comments
07.7	<p>For:</p> <ol style="list-style-type: none"> (Calcium carbide) is effective as similar effects to ethene; (Calcium carbide) is cheaper than ethene; (At all concentrations of calcium carbide) cell viability is not significantly reduced (as the SE overlap); <p>Against</p> <ol style="list-style-type: none"> (Calcium carbide) is toxic OR Calcium carbide causes an increase in cell apoptosis/necrosis (as concentration increases); Concentration of 0.025 (g dm⁻³) and above, the amount of apoptosis and necrosis is significantly different (as the SE do not overlap); No information about how much calcium carbide is eaten / is on each fruit; Data is from (isolated) cells not whole organisms; 	4	<p>Must have one point from each section for maximum marks</p> <p>2. Allow other ideas for cheaper e.g. 'more cost effective'</p> <p>If neither MP3 or MP5 awarded allow idea of overlapping/non-overlapping SE bars linked to significance for 1 mark</p>

Total		15	
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