

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

BL04

Unit 4 Control

Mark scheme

January 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	Restores a system to its original level;	1	

Question	Marking guidance	Mark	Comments
01.2	X on any downward slope (after carbohydrate meal);	1	

Question	Marking guidance	Mark	Comments
01.3	<p>During the fast:</p> <ol style="list-style-type: none"> 1. Decrease in blood glucose concentration (below set point) stimulates glucagon secretion; 2. Causing glycogenolysis/glycogen breakdown <p>OR</p> <p>Gluconeogenesis/changing non-carbohydrates into glucose</p> <p>OR</p> <p>Blood glucose concentration continues to fall as glycogen stores used up/glucose is used in respiration;</p> <p>After the protein meal:</p> <ol style="list-style-type: none"> 3. (Protein digested and) amino acids absorbed/into blood/into liver; 4. (Glucagon causes) gluconeogenesis/form glucose from non-carbohydrates so blood glucose concentration increases; 	4	4. Allow examples of non-carbohydrates, e.g. amino acids

Question	Marking guidance	Mark	Comments
02.1	Both correct for one mark A: Mitochondrion B: Vesicle;	1	A: Allow mitochondria

Question	Marking guidance	Mark	Comments
02.2	1. (Calcium ions entering the pre-synaptic neurone/neurone 1) cause vesicles to fuse with pre-synaptic <u>membrane</u> ; 2. Release neurotransmitter (into synaptic cleft and neurotransmitter diffuses across the cleft) to bind with receptors (on post-synaptic membrane, opening sodium ion channels);	2	

Question	Marking guidance	Mark	Comments
02.3	1. Unidirectional – vesicles/neurotransmitter in presynaptic neurone/neurone 1 (only) OR receptors on postsynaptic neurone/neurone 2 (only); 2. Summation – (temporal) due to several impulses arriving in quick succession OR (spatial) due to several presynaptic neurones converging on one postsynaptic neurone;	2	1. Allow description

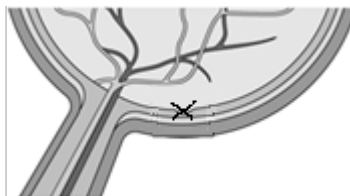
Question	Marking guidance	Mark	Comments
02.4	<p>1. (Inside post-synaptic membrane becomes) more negative/below resting potential/hyperpolarised</p> <p>OR</p> <p>Potential difference (across post-synaptic membrane) becomes larger;</p> <p>2. There are not enough sodium ions to cause depolarisation/action potential/reach threshold</p> <p>OR</p> <p>More sodium ions are needed for depolarisation/action potential/reaching threshold;</p>	2	

Question	Marking guidance	Mark	Comments
02.5	<p>Any one from:</p> <ol style="list-style-type: none"> 1. Make scoring objective/do not use subjective scoring 2. Make it so students do not know which tea they are drinking <p>OR</p> <p>(idea of removing) placebo effect</p> <ol style="list-style-type: none"> 3. Wait set time after finishing tea before rating stress 4. Repeat with larger numbers/larger spread of ages 5. Compare GABA-T with drink containing no GABA <p>OR</p> <p>(idea of) is dose of GABA high enough/test range of doses of GABA</p> <ol style="list-style-type: none"> 6. Investigate other compounds in tea 7. Randomise/standardise groups; 	1 max	

Question	Marking guidance	Mark	Comments
02.6	<ol style="list-style-type: none"> 1. Student 1 is using mean <u>and</u> Student 2 is using median; 2. (Data) Mean: T reduces stress by 1.9/from 4.8 to 2.9 <u>and</u> GABA-T reduces stress by 1.0/from 4.9 to 3.9 3. (Data) Median: both T and GABA-T reduce stress by 2/from 5 to 3; 	3 max	

Question	Marking guidance	Mark	Comments
03.1	1. Light breaks down/changes pigment in cells; 2. Sets up generator potential/action potential/impulse (in bipolar cell/receptor cell) OR Changes membrane potential/permeability to sodium ion;	2	1. Allow any correctly named pigment 2. Do not allow signal/message

Question	Marking guidance	Mark	Comments
03.2	2 marks for: 1094–1095;; 1 mark for: 1519.8–1521 (forgot to take 72%) 4377–4380 (used diameter)	2	Evidence of $4 \times \pi \times (22/2)^2 \times 0.72$ but incorrect answer for one mark

Question	Marking guidance	Mark	Comments
03.3	Back of eye matching part where only cone cells;	1	

Question	Marking guidance	Mark	Comments
03.4	1. (If turn head use edge of retina where) there are more rod cells (than cone cells); 2. Rod cells have low(er) visual acuity (than cone cells);	2	2. Allow description of visual acuity, e.g. there are several rod cells to one bipolar cell/neurone

Question	Marking guidance	Mark	Comments
03.5	<p>Any one from:</p> <ol style="list-style-type: none"> 1. Large sample size so representative/reliable 2. (Idea of) Double-blind so no bias (person or scientist)/overcomes placebo effect 3. Always using left eye for injection so ensures same eye gets (same) treatment <p>OR</p> <p>Always using left eye for injection so (idea of) not picking best/worst eye to treat</p> <ol style="list-style-type: none"> 4. Long period of time (injection every 6 weeks for 9 injections/54 weeks) so long-term effects seen 5. Groups at random so reduces bias; 	1 max	

Question	Marking guidance	Mark	Comments
03.6	<p>Must have one advantage and one disadvantage for full marks</p> <p>Advantage</p> <ol style="list-style-type: none"> 1. Drug/PEG reduces the decrease in visual acuity; <p>Disadvantage</p> <ol style="list-style-type: none"> 2. Drug/PEG does not prevent a decrease in visual acuity/does not cure; 3. (Idea of problems with injection) – could be painful, needed frequently/every 6 weeks/time-consuming, could be expensive; 	2	<ol style="list-style-type: none"> 1. Allow sight loss for visual acuity

Question	Marking guidance	Mark	Comments
04.1	IAA/auxin – tropisms/cell elongation; ABA/abscisic acid – closure of stomata;	2	Allow other named auxins with correct process Allow other correct processes for ABA, e.g. seed dormancy, fruit ripening Allow other named plant growth substances, e.g. gibberellins, cytokinins with correct process Allow description of correct processes

Question	Marking guidance	Mark	Comments
04.2	1. (Idea of) increased length may not correlate with increased volume; 2. Larger sample so less effect of outliers/more reliable mean; 3. (Idea of) less prone to mistakes/more accurate (in measuring grain);	2 max	1. Examples: length is 1–D but grains are 3–D, OR grains could be wider rather than longer (so volume larger)

Question	Marking guidance	Mark	Comments
04.3	For full marks, must mention significance at least once 1. On d5 PGS production is below detectable limit; 2. On d8 both varieties produce similar/not significantly different concentrations of PGS; 3. On d10 variety E produces significantly more PGS than D ;	3	1. Allow no PGS detected/produced 2. Allow D slightly higher for similar

Question	Marking guidance	Mark	Comments
04.4	<p>Hypothesis 2 larger cells (no mark)</p> <p>1. Synthesis of more starch would need larger cells to store it;</p> <p>2. Starch synthesis occurs on d10 when PGS is (significantly) higher in variety E</p> <p>OR</p> <p>When mitosis occurs on d8, varieties D and E have similar PGS</p> <p>OR</p> <p>When mitosis occurs on d5, no PGS is detected;</p> <p>For 1 mark</p> <p>Hypothesis 1 (no mark)</p> <p>3. More mitosis results in more cells;</p>	2 max	

Question	Marking guidance	Mark	Comments
04.5	<p>1. MicroRNA complementary to mRNA/binds to mRNA (from gene);</p> <p>2. Prevents translation/protein being made;</p>	2	2. Allow causing break down of mRNA

Question	Marking guidance	Mark	Comments
04.6	When YA13 expression is prevented (with microRNA) the grains have larger mass;	1	

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Question	Marking guidance	Mark	Comments
04.7	1. YA13 does not control grain size in E ; 2. The microRNA is not (sufficiently) complementary to the mRNA from gene YA13 in variety E (as E has a mutation/different allele/base sequence);	2	

Question	Marking guidance	Mark	Comments
04.8	Must have one advantage and one disadvantage for full marks Advantages 1. Could increase grain size and larger grains increase the yield; Disadvantages 2. MicroRNAs are not specific so could bind mRNAs from other genes and prevent translation/switch off other genes; 3. Might adversely affect other <u>named</u> variable; 4. Difficult/expensive to use microRNA;	2 max	3. Accept examples like nutritional value, taste, storage life, allergic reaction

Question	Marking guidance	Mark	Comments
05.1	Taxis has direction OR Kinesis is random/non-directional;	1	Assume 'it' refers to taxis

Question	Marking guidance	Mark	Comments
05.2	1. To move organism to (more) favourable environmental conditions; 2. To increase survival;	1 max	1. Allow to stay in favourable environmental conditions

Question	Marking guidance	Mark	Comments
05.3	1. Put woodlice in and leave for set time, e.g. 5 minutes; 2. Count number (of woodlice) in each half; 3. Repeat at least twice more with (new) woodlice (and calculate mean); 4. Control temperature/light/equilibrate choice chamber;	3 max	2. Allow measure time woodlouse in each half (but only for one woodlouse at a time) 3. Idea of at least 2 more repeats/experiment done at least 3 times needed

Question	Marking guidance	Mark	Comments
05.4	There is no significant difference between the number of woodlice in the wet and dry conditions;	1	Allow any difference between the number of woodlice in wet and dry conditions is due to chance Allow no difference between observed and expected results

Question	Marking guidance	Mark	Comments
06.1	1. Full-thickness damages/destroys nerves/receptors (and superficial does not); 2. (No nerves so) cannot pass impulses (to brain) to feel pain;	2	2. Do not allow signals/messages

Question	Marking guidance	Mark	Comments
06.2	8.4(375) = 3 marks ;;; Incorrect answer of 506.25/506.3 ie not divided by 60 = 2 marks OR Incorrect answer of 67.5 = ie not divided by 8 = 2 marks OR Incorrect answer of 16.875/16.88/16.9 ie. not divided by 2 = 2 marks OR Incorrect answer of 4050 ie. not divided by 8 and not divided by 60 = 1 mark OR Incorrect answer of 1012.5 ie. not divided by 2 and not divided by 60 = 1 mark OR Incorrect answer of 135 ie. not divided by 2 and not divided by 8 = 1 mark	3	If incorrect order of magnitude reduce by 1 mark e.g. 0.0844 = 2 marks 5.06 = 1 mark 0.675 = 1 mark 0.169 = 1 mark

Question	Marking guidance	Mark	Comments
06.3	1. (Stem cells) keep dividing to replace damaged cells; 2. (Stem cells) differentiate/change into different cell types/form different (skin) layers;	2	1. Allow mitosis but do not allow meiosis

Question	Marking guidance	Mark	Comments
06.4	1. Wound is significantly smaller <u>and</u> scar tissue is significantly thinner; 2. Size 1350 and 1750 or 400 μm difference <u>and</u> thickness 48 and 74 or 26 μm difference;	2	1. Needs significantly at least once 2. Allow range 1340 to 1360 and 1740 to 1760

Question	Marking guidance	Mark	Comments
06.5	<p>Mark in pairs</p> <ol style="list-style-type: none"> 1. Compare SCBS with other stem cells; 2. As other stem cells might grow faster; <p>OR</p> <ol style="list-style-type: none"> 3. Test on burn; 4. As cuts may heal differently to burns; <p>OR</p> <ol style="list-style-type: none"> 5. Test on larger wounds; 6. As skin grafts used for larger burns/burns >20% TBSA; <p>OR</p> <ol style="list-style-type: none"> 7. Test on humans/do clinical trial; 8. As current research is human cells on mice; <p>OR</p> <ol style="list-style-type: none"> 9. Test for longer time/time how long it takes (to heal); 10. To see if wound heals completely/with less scarring/more quickly; <p>OR</p> <ol style="list-style-type: none"> 11. Test sensitivity of new skin; 12. To see if new skin is (as) responsive/has nerve connections; 	2 max	

Question	Marking guidance	Mark	Comments
07.1	<p>1. Swimming training <u>significantly</u> increases % slow fibres;</p> <p>2. (Slow fibres have) more blood vessels to bring oxygen/glucose to muscle;</p> <p>3. (Slow fibres have) more mitochondria for ATP production/aerobic respiration;</p> <p>4. So muscle fatigues less</p> <p>OR</p> <p>less likely to generate lactic acid/respire anaerobically;</p>	4	<p>1, 2, 3, 4 Allow converse for fast fibres</p> <p>2. Allow (Slow fibres have) more myoglobin (high oxygen affinity) so more oxygen into muscles/oxygen store</p>

Question	Marking guidance	Mark	Comments
07.2	<p>1. (Power exercise is intense) so cannot do aerobic respiration quickly enough</p> <p>OR</p> <p>cannot get enough oxygen to muscles fast enough</p> <p>OR</p> <p>will need anaerobic respiration;</p> <p>2. (More creatine formed into more) phosphocreatine to provide phosphate ion;</p> <p>3. To combine with ADP and form more ATP (for energy to exercise);</p>	3	

Question	Marking guidance	Mark	Comments
07.3	1. To show any change in muscle performance is due to creatine; 2. To exclude placebo effect; 3. (Biology students) should know expected effect of creatine so this might influence their performance;	1 max	

Question	Marking guidance	Mark	Comments
07.4	<p>Mark in pairs 1 and 2, 3 and 4, 5 and 6</p> 1. Total exercise time increases significantly as the intervals of time cycling decrease / M is more total time than J ; 2. Stage 1 increase is 120 s/3.4 times/50 s to 170 s; OR Stage 2 increase is 280s/5.7 times/60 s to 340 s; 3. Creatine does not significantly increase total time for continuous cycling / J ; 4. (J) Stage 1 is 50 s and Stage 2 is 60 s; 5. Creatine significantly increases total exercise time for all other exercise types/ K/L/M ; 6. Stage 2 is longer by K = 55s/1.6 times/90 s to 145 s OR L = 80s/1.6 times/125 s to 205 s OR M = 170s/2x/170 s to 340 s;	4 max	

Question	Marking guidance	Mark	Comments
07.5	<p>Agree</p> <ol style="list-style-type: none"> 1. Mushroom (product significantly) increases swimming time/endurance; 2. The higher the mushroom (product) concentration the longer the swimming time; 3. Mass of mushroom (product) given is relative to body mass so could just increase dose for human; 4. Mice are mammals so effect likely to be similar in humans; 5. Group size (10) is large enough to be reliable/group size same in both investigations; <p>Disagree</p> <ol style="list-style-type: none"> 6. Mushroom (product) tested in mice, creatine in humans so (may not be) not comparable; 7. Dose of creatine unknown/not related to body mass; 8. Creatine tested for power, mushroom (product) for endurance <p>OR</p> <p>creatine measured over seconds, mushroom (product) over minutes</p> <p>OR</p> <p>mushroom (product) given for 7 days, creatine given for 11 days;</p> <ol style="list-style-type: none"> 9. (Idea of) any effect could be elsewhere in body rather than (just) in muscle; 10. Only one type of mushroom tested (may not apply to all mushroom types) <p>OR</p> <p>(Idea of) Mushroom product might not be same as eating whole mushroom;</p>	3 max	<p>Must have at least one mark from agree and one mark from disagree for full marks</p> <p>8. Allow creatine test for power, mushroom (product) not</p> <p>OR</p> <p>mushroom (product) tested for endurance, creatine not</p>