

Markscheme

May 2026

Biology

Standard level

Paper 2

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Subject Details: Biology SL Paper 2 Markscheme

Candidates are required to answer **all** questions in Section A and **one** out of **two** questions in Section B. Maximum total = **50 marks**.

1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. An alternative answer is indicated by “**OR**”. Either answer can be accepted.
5. An alternative markscheme is indicated under heading **ALTERNATIVE 1** etc. Either alternative can be accepted.
6. Words in brackets () in the markscheme are not necessary to gain the mark.
7. Words that are underlined are essential for the mark.
8. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
9. If the candidate’s answer has the same “meaning” or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect).
10. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
11. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking indicate this by adding **ECF** (error carried forward) on the script.
12. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

Section B

Extended response questions - quality of construction

- ♦ Extended response questions for SLP2 carry a mark total of **[16]**. Of these marks, **[15]** are awarded for content and **[1]** for the quality of the answer.
- ♦ **[1]** for quality is to be awarded when:
 - ♦ the candidate's answers are clear enough to be understood without re-reading.
 - ♦ the candidate has answered the question succinctly with little or no repetition or irrelevant material.
- ♦ It is important to judge this on the overall answer, taking into account the answers to all parts of the question. Although, the part with the largest number of marks is likely to provide the most evidence.

Candidates that score very highly on the content marks need not necessarily automatically gain **[1]** for quality (and *vice versa*).

Section A

Question			Answers	Notes	Total
1.	a	i	a. overall negative relationship/correlation (with a slight increase at 5.0 mg ml ⁻¹); b. as concentration increases, root length decreases overall (with a slight increase at 5.0 mg ml ⁻¹);	<i>Do not accept “inversely proportional” alone.</i>	1 max
1.	a	ii	a. both decrease after 2.5 (mg ml ⁻¹) OR both (have an overall) decrease; b. height increases (at low sumac root concentration) and then decreases while biomass only decreases/does not increase / <i>OWTTE</i> OR above ground biomass (%) change/decrease is greater than height change/decrease;	<i>No credit for just recording numbers.</i>	2
1.	a	iii	(-) 26.8 (decrease);		1
1.	b	i	0.33 (+/- 0.01);	<i>Units not required</i>	1
1.	b	ii	a. overall there is a decrease; b. decrease in activity at low (extract) concentrations/with initial increase concentration from 0.0 to 2.5 (mg ml ⁻¹) OR decrease in activity at high (extract) concentrations/from 7.5 to 10.0 (mg ml ⁻¹); c. no/little change (in activity) as increase concentration from 2.5 to 7.5 (mg ml ⁻¹);	<i>No credit for just recording numbers nor inversely proportional alone.</i>	2 max
1.	c		the treated soil has lower/less species/microbial diversity/richness/biodiversity;	<i>OWTTE / converse</i>	1

Question			Answers	Notes	Total
1.	d		(Yes, it does support the hypothesis) [Max 2] a. root extract would contain chemicals produced by the plant; b. increased root extract caused decrease in plant growth parameters; c. increased root extract caused decrease in microbial activity; d. change in microbes could influence decomposition/nutrients available/osmolarity of soil/soil pH (which affect plant growth); (No) [Max 2] e. investigation done in a lab rather than in the wild where other factors may affect results OR very low sample size/only five pots/a large overlap of error bars in parts of the range / OWTTE; f. natural soil could be different in microbes present compared to the soil used in the laboratory; g. low/2.5 (mg ml⁻¹) dose increases plant height when compared to control / even high doses of sumac extract does not completely inhibit microbial activity;	<i>Mp b: Accept any of the specific plant growth parameters.</i>	3 max

Question		Answers	Notes	Total
2.	a	a. Property: solubility (in water) / hydrophilic; b. Function: for transportation (in blood/plant sap/cell sap/tissue fluid); ALTERNATIVE c. Property: chemical stability / can form starch/glycogen; d. Function: for energy storage; ALTERNATIVE e. Property: chemical stability / can form cellulose/DNA/RNA; f. Function: for structure; ALTERNATIVE g. Property: can be oxidised/broken down / <i>OWTTE</i>; h. Function: used in respiration / source of energy/ATP / energy release;	<i>Property and function must be from the same alternative for two marks and answers must be in the correct category (Property or Function) but only a property or function can gain 1 Mp.</i>	2 max
2.	b	a. energy is lost (from organisms) as <u>heat</u>; b. energy losses due to (cell) respiration/metabolism/movement; c. (energy is lost because) parts of the food/prey are not eaten/consumed/ingested OR (energy is lost because) not all organisms/individuals are eaten/consumed; d. (energy is lost with) partial/incomplete digestion of the (ingested) food / faeces; e. energy not recycled;	<i>Mp c: accept relevant examples of uneaten parts e.g. bones</i> <i>Mp d: accept relevant examples of undigestible parts e.g. cellulose/chitin.</i>	3 max

Question			Answers	Notes	Total
3.	a		provides temperature/thermal stability in the aquatic habitats/internal body temperature OR prevents sudden temperature changes in the aquatic habitats/internal body temperature OR water absorbs more energy therefore can transport heat around the body (eg core to skin for cooling);	<i>When the word Aquatic appears, an example can be used instead eg lake, river, sea</i>	1
3.	b		a. water enters the organism by <u>osmosis</u> OR due to concentration gradients, water enters the organism; b. absorbs/expels water to maintain isotonic cell levels OR regulates the quantity of water in the cell / osmoregulation; c. avoids the lysing/bursting (of the cell by regulating quantity of water in the cell) / OWTTE;		2 max
3.	c		a. extensive/widespread/deep roots to absorb water; b. no leaves/very thick cuticle/surface to prevent evaporation / OWTTE; c. stomata open at night only / sunken stomata to prevent excessive loss of water/transpiration during the day; d. (specialized) tissues to store water; e. any other verifiable reasons not covered above;	<i>Both the adaptation and outcome are needed for each mark.</i> <i>Do not accept spines related to predation</i>	2 max

Question			Answers	Notes	Total
4.	a		Similarity: [MAX 2] a. both are polymers/made of <u>nucleotides/phosphate+sugar+base</u>; b. both have a sugar-phosphate backbone; c. both use the nitrogenous bases adenine, guanine and cytosine; Differences: [MAX 2] d. RNA is single stranded while DNA is double stranded; e. RNA has uracil while DNA has thymine (instead of uracil); f. RNA has ribose sugar (in backbone) while DNA has deoxyribose (in backbone);	<i>Mp c: The names of the common bases must be indicated. Accept the use of A, G, C, as well as full names.</i>	3 max
4.	b		a. base substitution is a change of one of the bases for another; b. base insertion/addition is when an extra base is inserted into the DNA chain; c. base deletion/removal is when a base (or several) is removed from the DNA chain;		2 max

Question			Answers	Notes	Total
4.	c		a. base sequences can be compared between different species; b. the sharing of common DNA sequences/code is evidence of evolution/common ancestry; c. the more similar the base sequences are, the closer (in time) they are to their common ancestor / <i>OWTTE</i> / accept converse OR the more similar the base sequences are, the more related the two species are / <i>OWTTE</i> / accept converse OR species with similar DNA bases sequences share a more recent common ancestor; d. example: chimpanzees share a high percentage of DNA sequences with humans which indicate (recent) common ancestors OR any other verifiable example; e. allows the development of Cladograms which establish evolutionary relationships based on differences in DNA base sequences (this is HL material but can award a mark for correct Biology);	<i>Any comparison must be between living or recently extinct species.</i> <i>Mp b. code can be accepted if it refers to base sequences, not the genetic code alone.</i>	2 max

Question			Answers	Notes	Total
5.	a		uses both autotrophic nutrition / producers AND heterotrophic nutrition / consumers OR (uses autotrophic nutrition as) it has chloroplasts for photosynthesis / feeds itself in light AND (uses heterotrophic nutrition as) it can take in food (particles) / phagocytosis / <i>OWTTE</i> ;	<i>Both forms of nutrition must be included in the answer.</i>	1
5.	b		a. in parasitism only the parasite benefits AND example; b. in mutualism each organism benefits AND example; ALTERNATIVE c. a valid statement of the differences between parasitism AND mutualism; d. correct example for parasitism AND mutualism;	<i>Do not accept any viral/bacterial/protozoan/fungal infections/disease (pathogenicity) as examples of parasitism.</i> <i>Accept OWTTE and any other verifiable example.</i> <i>Eg. ticks on human.</i> <i>Eg. bacteria in root nodules, mycorrhizae in Orchidaceae (orchid family) or zooxanthellae in corals.</i>	2
5.	c		a. competition (occurs between individuals of a species) for resources / <i>OWTTE</i> OR overproduction leads to competition; b. variations exist in individuals (of the same species) / <i>OWTTE</i> OR variation changes survival/fitness; c. higher levels of fitness/better adapted lead to higher survival of an individual OR different environments lead to different selective pressures; d. (better adapted individuals) survive and <u>reproduce</u> OR advantageous alleles/traits pass to/inherited by the offspring; e. allele frequency/frequency of traits changes;	<i>All points must refer to competition within a species.</i> <i>Marking points can be credited for a valid example.</i> <i>Do not accept genes in place of alleles.</i>	3 max

Section B

Clarity of communication: [1]

The candidate's answers are clear enough to be understood without re-reading. The candidate has answered the question succinctly with little or no repetition or irrelevant material.

Question			Answers	Notes	Total
6.	a		a. composed of amino acids; b. amino acids joined by peptide bonds/condensation reaction/C-N bond; c. there can be any of the (different/20) amino acids/R groups in a peptide OR the amino acids can be in any order in a peptide; d. (amino acid/peptides has) carboxyl group at one end AND an amine group at the other end; e. can be composed of 2 amino acids/dipeptide up to thousands/polypeptides;	Accept any of the marking points in annotated diagram.	3 max

Question			Answers	Notes	Total
6.	b		a. glycoproteins are antigens on red blood cells; b. four different blood groups – A, B, AB, O; c. blood group A has A antigen / blood group B has B antigen OR blood group AB has both antigens OR blood group O has no antigens; d. are controlled by multiple alleles OR controlled by alleles I^A, I^B, O/i; e. I^A AND I^B are dominant to i /visa versa; f. I^A AND I^B are codominant alleles OR blood group O is ii OR blood group AB is $I^A I^B$; OR blood group A can be $I^A I^A$ or $I^A i$ OR blood group B can be $I^B I^B$ or $I^B i$;	<i>An appropriate diagram or Punnet square can be accepted for marking points</i> <i>Reference to coagulation, etc., should not be credited.</i> <i>Accept glycoprotein in place of antigen.</i> <i>Mp b: can be given if all four blood groups are identified throughout the question.</i>	4 max

Question			Answers	Notes	Total
6.	c		a. pathogens are recognized by their antigens/glycoproteins/proteins on the surface; b. phagocytes recognize pathogens; c. phagocytes engulf pathogens/endocytosis; d. phagocytes present antigens (on membrane); e. helper-T lymphocytes/cells recognize/bind to foreign antigens OR B lymphocytes/cell recognize/bind to foreign antigens; f. (helper T-lymphocytes) (stimulate) B-lymphocytes/cells to produce antibodies; g. activated B-lymphocytes/cells form clones of/many plasma cells / <i>OWTTE</i>; h. each clone of plasma/B-cells produces a <u>specific</u> type of antibody; i. antibodies attach to (specific) antigens; j. activated B-lymphocytes/cells become memory cells; k. memory cells are plasma cells with long-term survival/remain in the body OR memory cells produce long-term/adaptive immunity in humans OR memory cells allow a faster immune response/eliminate infectious disease more quickly/efficiently;		8 max

Question			Answers		Notes	Total
7.	a				<i>Answer does not need to be in table format BUT must mention both eukaryotic and prokaryotic cells in each point.</i>	3 max

Question			Answers	Notes	Total
7.	b		a. compartmentalization is the separation by cell membranes; b. the nucleus/organelles/cytoplasm are separate compartments; c. separation of gene transcription and translation / increases surface areas of membranes in organelles (eg. mitochondria) / allows named organelles to carry out a named function; d. post-transcriptional modification of mRNA can happen before the mRNA meets ribosomes in the cytoplasm in eukaryotes; e. concentration of metabolites/enzymes; f. separation of incompatible biochemical processes/different pHs / allows (controlled) transport/movement of substances in the cell (eg. vesicles/endoplasmic reticulum); g. substances that can damage the cell are kept in compartments e.g. lysosomes and phagocytic vacuoles;		4 max

Question			Answers	Notes	Total				
7.	c		<table><tr><th>Sexual reproduction in plant [Max 6]</th><th>Promote cross-pollination</th></tr><tr><td>a. gametes produced by meiosis; b. female gametes produced inside ovules/ovary; c. male gametes/pollen produced in anthers; d. pollination is transfer of pollen from anther to stigma; e. animals/wind can transfer pollen between plants; f. pollen tube carries male gametes down the style/into the ovule/ovary; g. fertilization is fusion of gametes/nuclei; h. fertilization produces an embryo/leads to seed formation;</td><td>i. cross-pollination is promoted by different maturation times for pollen and stigma; j. separate male and female flowers (so they don't self-pollinate) OR male and female plants (so they don't self-pollinate); k. structure in flowers preventing pollen falling on stigma eg different length/complex petal arrangement; l. genetic incompatibility / <i>OWTTE</i>; m. specific features to attract pollinators or capture pollen eg bright flowers/strong scent/nectary/ feathery stigma/lots of pollen;</td></tr></table>	Sexual reproduction in plant [Max 6]	Promote cross-pollination	a. gametes produced by meiosis; b. female gametes produced inside ovules/ovary; c. male gametes/pollen produced in anthers; d. pollination is transfer of pollen from anther to stigma; e. animals/wind can transfer pollen between plants; f. pollen tube carries male gametes down the style/into the ovule/ovary; g. fertilization is fusion of gametes/nuclei; h. fertilization produces an embryo/leads to seed formation;	i. cross-pollination is promoted by different maturation times for pollen and stigma; j. separate male and female flowers (so they don't self-pollinate) OR male and female plants (so they don't self-pollinate); k. structure in flowers preventing pollen falling on stigma eg different length/complex petal arrangement; l. genetic incompatibility / <i>OWTTE</i> ; m. specific features to attract pollinators or capture pollen eg bright flowers/strong scent/nectary/ feathery stigma/lots of pollen;		8 max
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