

Markscheme

May 2026

Biology

Higher level

Paper 1B

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Subject Details: Biology HL Paper 1b Markscheme

Candidates are required to answer **all** questions. Maximum total = **35 marks**.

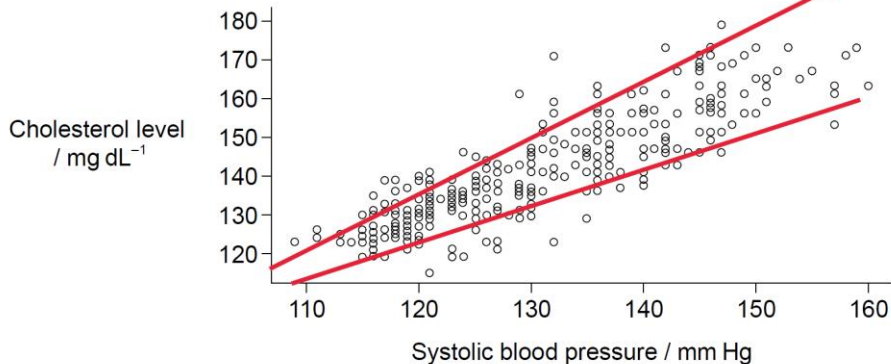
1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. An 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.

Question			Answers	Notes	Total
1.	a		8500(X);	Accept answers between 8000x and 9000x.	1
1.	b		nucleus;	Do not allow nuclear membrane. Mark only the first answer if more than one is provided. Allow notes stating that the nuclear membrane is pointed at, providing that they establish that the organelle is the nucleus.	1
1.	c		Animal cell because it a. lacks chloroplasts; b. lacks cell wall; c. lacks a large/central vacuole; d. has microvilli;	Mark the first relevant reason if more than one is provided. Accept arguments worded for not being a plant cell.	1 max
1.	d		a. has a double membrane; b. has <u>70S</u> ribosomes (similar to prokaryotes/bacteria); c. has its own <u>DNA</u> OR circular (naked) <u>DNA</u> ; d. reproduce on its own / OWTTE; e. it must have been engulfed by another cell/engulfed by endocytosis;	Mp c: Do not accept “genetic material”. Mp d: Do not accept reproduce by binary fission if “on its own/independently” is not mentioned. Mp e: Accept a description of endosymbiosis. Mp e: Accept synonyms for “engulfed”. Mp e: Do not award a mark for simply stating mitochondria or chloroplasts.	2 max

Question			Answers	Notes	Total
1.	e		a. (organelles) allow carrying out specific functions in specific subunits; b. control/separate (micro)environment/conditions for metabolic reactions/pH; c. control/separate concentrations of molecules within organelle OR control/separate concentration gradients for molecules inside and outside the membrane; d. separation of incompatible biochemical processes/enzymes/toxins/OWTTE; e. for example, lysosomes isolate enzymes from the cytoplasm / mitochondrial membranes isolate proton gradients; f. nucleus separates the activities of gene transcription and translation OR post-transcriptional modification of mRNA can happen in the nucleus;	<i>Do not accept confusion between cells and organelles.</i> <i>Compartmentalization must be addressed, not only the function of each organelle.</i> <i>Mp b is for conditions. Mp c is for molecules. Mp d focuses on incompatibility. Mp e is for examples; allow other correct examples.</i>	3 max

Question			Answers	Notes	Total
2.	a		0.65 bubbles per second/second ⁻¹ OR 39 bubbles per minute/minute ⁻¹ OR 78 bubbles per 2 minutes/2 minute ⁻¹ ;	<i>Units required.</i> <i>Allow abbreviations, e.g. s., min., sec., etc., but “bubbles” and “per” or “⁻¹” must be present.</i> <i>Verify that the number matches the units (e.g. 78 bubbles per minute is incorrect).</i>	1
2.	b		a. positive correlation/relationship; b. as light intensity increases, rate increases/ <i>vice versa</i> ;	<i>Mp a: Do not accept “directly proportional”.</i>	1 max
2.	c	i	a. to control the heat produced by the lamp/heat sink; b. to prevent overheating of the <i>Elodea</i> ; c. to maintain constant temperature of water (in boiling tubes);	<i>Mark only the first answer written if more than one is provided.</i> <i>Do not accept that it acts as a control variable unless heat is mentioned.</i>	1 max
2.	c	ii	a. pH of the water OR carbon dioxide concentration; b. temperature; c. variables affecting the <i>Elodea</i> ; d. lamp bulb characteristics; e. external light sources;	<i>Mark only the first two answers written if more than two are provided.</i> <i>Do not accept time, number of trials or distance as are provided in the question.</i> <i>Mp c: Any variation within the plants, e.g. number, mass, length, source, species, etc.</i> <i>Mp d: Could be type, wattage, brightness, colour, etc.</i>	2 max

Question			Answers	Notes	Total
2.	d		a. <u>photolysis</u> of water; b. (water is split into) protons/H⁺, electrons/e⁻ and oxygen/O₂; c. (photolysis occurs) in photosystem II/PSII; d. using energy from photons/light; e. oxygen/O₂ is released as a byproduct/waste; f. in the thylakoids (located in chloroplasts);	<i>This question is about how oxygen is produced, so we don't want answers explaining the whole process of photosynthesis, or movements within the plant, e.g. release of oxygen through stomata. There is no mark for stating the general equation of photosynthesis.</i> <i>Mp a: Correct term required, do not accept hydrolysis.</i> <i>Mp b: All three required, do not accept hydrogen alone.</i> <i>Mp b: Accept if written as an equation involving water, protons, electrons and oxygen.</i> <i>Mp c: Do not accept photosystem I, nor photosystem I and II, or unspecified photosystem for photolysis.</i> <i>Mp d: Using light must be in relation to photolysis, not other aspects of photosynthesis e.g. Calvin cycle.</i> <i>Mp e: Award mp e for specifying that O₂ is the waste product. Do not accept oxygen being a by- product of light-independent reactions.</i>	4 max

Question		Answers	Notes	Total
3.	a	accept any straight line that fits within the following range;  [Source: Used with permission of Springer Nature BV, from A nonparametric copula-based decision tree for two random variables using MIC as a classification index, Khan, Y. A.; Shan, Q. S.; Liu, Q.; Abbas, S. Z., Vol 25, Issue 15, 2021; permission conveyed through Copyright Clearance Center, Inc.]	Line must be straight. The line does not have to touch the axes.	1
3.	b	a. strong correlation/relationship (between cholesterol level and systolic blood pressure); b. positive correlation/relationship (between cholesterol level and systolic blood pressure); c. close to 1; d. likely to be significant due to large sample; e. level or significance should be assessed from statistical test / OWTTE;	Do not accept a simple description, e.g. “As cholesterol level increases systolic pressure increases”. Mp a: Accept high as an alternative to strong; do not accept “significant” as an equivalent of “strong”. (Significance is addressed through mps d and e). Mp d and e: Do not accept stating “statistically significant” without addressing sample size or some statistic application. Mp e: “correlation doesn’t mean causation”	2 max

Question			Answers	Notes	Total																								
3.	c		a. use (two) fingers to feel/press on (carotid/radial) <u>artery</u>; b. count pulse over a specific time frame OR measured in beats per minute/bpm; c. use stethoscope/electronic device/finger clip/smart watch;	Do not accept mpa if thumb is mentioned. Mp a: Do not accept veins. Mp a: “neck”, pulse or “wrist” alone are TV. Mp b: Accept examples, e.g. 10 seconds. Mp c: Accept valid named electronic device. Mp c: Do not accept “sphygmomanometer” unless “digital/electronic” is specified.	2 max																								
3.	d		<table><tr><td colspan="2">Differences [2 max]</td></tr><tr><td><i>Bony fish</i></td><td><i>Mammals</i></td></tr><tr><td>a. single circulation</td><td>double circulation;</td></tr><tr><td>b. blood travels through gills</td><td>blood travels through lungs;</td></tr><tr><td>c. heart to gills to other organs</td><td>heart to lungs to heart to other organs</td></tr><tr><td>OR</td><td>OR</td></tr><tr><td>blood passes through the heart once</td><td>blood passes through the heart twice;</td></tr><tr><td>d. (only) deoxygenated blood passes through the heart</td><td>(both) oxygenated and deoxygenated blood pass through the heart;</td></tr><tr><td colspan="2">Similarities [2max]</td></tr><tr><td>e. carbon dioxide is exchanged for oxygen in both;</td><td></td></tr><tr><td>f. blood passes through capillaries (for diffusion/gas exchange) for both;</td><td></td></tr><tr><td>g. both have closed circulation;</td><td></td></tr></table>	Differences [2 max]		<i>Bony fish</i>	<i>Mammals</i>	a. single circulation	double circulation;	b. blood travels through gills	blood travels through lungs;	c. heart to gills to other organs	heart to lungs to heart to other organs	OR	OR	blood passes through the heart once	blood passes through the heart twice;	d. (only) deoxygenated blood passes through the heart	(both) oxygenated and deoxygenated blood pass through the heart;	Similarities [2max]		e. carbon dioxide is exchanged for oxygen in both;		f. blood passes through capillaries (for diffusion/gas exchange) for both;		g. both have closed circulation;		Allow answers in annotated circuit diagrams. Both elements of each marking point must be present to award a mark. Mp b: Do not accept “gills” and “lungs” without reference to the blood. Mp c: Accept fish heart a single pump/has one ventricle/two chambers AND mammal heart is double/left and right sides/has two ventricles/four chambers.	3 max
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Question			Answers	Notes	Total
4.	a		9.3;	<i>Units not required.</i> <i>Accept answers between 9.2 and 9.4.</i> <i>Only mark the first answer given but do not give the mark if it is a range.</i>	1
4.	b		(mean) number/quantity of spots (per fish);	<i>Do not accept “amount” instead of “number”.</i> <i>Accept “average”.</i> <i>If more than one answer is given, mark the first one provided, but do not award a mark if they refer to an independent variable in this investigation (number of months or the type of the predator).</i>	1

Question			Answers	Notes	Total
4.	c		a. female guppies mate/reproduce with males with more spots more frequently OR <u>sexual selection</u> for more spots; b. thus, the spotted trait/characteristic/phenotype/allele is passed on to offspring OR increasing the frequency of the spotted trait/characteristic/phenotype/allele in the offspring/with each generation; c. natural selection has occurred;	<i>Mp a. The answer must refer to mating/reproduction, not just attracting females.</i> <i>Mp b: Do not accept gene.</i>	2 max
4.	d		a. control ponds with no predators showed an increase in number of spots/variations; b. in ponds with cichlids/strong predators the number of spots/variations decreased OR the stronger predator/cichlid negatively affected the number of spots/variations in the offspring; c. (ponds with) weaker predator/<i>Rivulus</i> show increased numbers of spots/variation OR the presence of a weaker predator/<i>Rivulus</i> does not affect the number of spots/variations; d. the effect depends on the type of predator/strong or weak;	<i>Do not accept reference to the lowest/highest, more/less number of spots, without referring to decrease/increase in number of spots</i>	3 max
4.	e		a. no natural selection; b. large population (of guppies); c. no migration/immigration/emigration (of guppies)/no gene flow/no genetic drift; d. no mutations; e. random mating (of guppies);	<i>Mp a: Accept no disease, no predation, etc.</i> <i>Do not accept environmental changes.</i>	3 max