

Markscheme

May 2025

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 mark

- Extended response questions for SLP2 each 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	8.8/ -8.8;		1
1.	b	<p>Similarities</p> <p>a. both decreased / symptoms/brain function worsened for both groups; b. both show greatest/fastest decrease in the final weeks (at/after week 24-36) OR both show least/slowest decrease in the first weeks (before week 24);</p> <p>Differences</p> <p>c. control group lower/decreased more/faster than treatment group (at all times/throughout the investigation) OR final value of Donanemab is higher than control/accept converse; d. increased for treatment group up to week <u>12</u> but did not change/slightly decreased for control group; OR the treatment group was greater than/above the base line up to week <u>24</u> but did not change/slightly decreased for control group;</p>	<p><i>d. There must be time (i.e. week 12 or 24) mentioned.</i></p>	3 max
1.	c	unethical not to treat patients/to withhold treatment / patients could die (symptoms get worse) if not treated / so as not to leave patients without treatment;		1
1.	d	280 (ng L ⁻¹);	Accept answers in the range 270-280.	1

Question		Answers	Notes	Total
1.	e	<p>a. outlier;</p> <p>b. (both values) are more than 1.5 times the interquartile range/IRQ above the third/upper quartile/maximum height;</p>		1 max
1.	f	<p><i>Supporting statements:</i></p> <p>a. (both) AD groups have a higher (median) level (of SNAP-25) than healthy people;</p> <p>b. great/high overlap for mild and severe AD BUT less/little overlap between no AD and the other groups;</p> <p><i>Non supporting statements:</i></p> <p>c. ranges/values of (all) groups overlap;</p> <p>d. (so) differences may not be significant/reliable</p> <p>OR</p> <p>(so) cannot distinguish between healthy people and Alzheimer’s disease/mild dementia and severe dementia;</p> <p>e. small sample size for AD groups (so less representative of population);</p> <p>f. used only two groups for dementia / only looked at mild and severe dementia;</p>	<p><i>If response only supports or doesn't support the use of SNAP-25 Max 2 awarded</i></p> <p><i>Responses need to cover both support and non-support but do NOT need to specifically say if a statement does support/not support as long as a conclusion is drawn.</i></p>	3 max

Question		Answers	Notes	Total
2.	a	condensation;		1
2.	b	glycerol;		1
2.	c	(cis/mono) unsaturated;		1
2.	d	a. stable/not so readily metabolised so energy not (easily) lost/released; b. insoluble/do not mix with water so no osmotic effect/does not affect water potential/water does not enter cells; c. insoluble/large/nonpolar molecule so transport is difficult/hard; d. large molecule/long chains/many C-H bonds so can store lots of energy OR twice as much energy can be stored/released (per g) compared to carbohydrate;		2 max

Question		Answers	Notes	Total
3.	a	a. prioritizes globally endangered species for conservation; b. identifies species that have few close relatives/evolutionarily distinct; c. species recognised at a grassroots level/ program is run at a local level WTTE/Important for maintaining <u>biodiversity</u> ; d. named relevant example of a species or EDGE program;	d. <i>Examples may include</i> <i>Chinese Giant Salamander (Andrias davidianus)/Pangolins (e.g., Sunda Pangolin Manis javanica)/ Aye-aye (Daubentonia madagascariensis)</i> <i>But any other correct and verified example is allowed</i>	2 max
3.	b	a. (later) rise in water level led to <u>geographical/geographic</u> isolation; b. reproductive isolation / no interbreeding (because of barrier) / no gene flow (between populations); c. different selective pressures/environments (for each population); d. different adaptations favoured/survive and reproduce more / differential selection/natural selection (for each population); e. populations diverge/can no longer interbreed (even when barrier is removed);	d. <i>Must refer to adaptations and the action i.e. survive and reproduce.</i>	3 max

Question		Answers	Notes	Total
4.	a	combination of <u>alleles</u> carried/inherited (by an organism);		1
4.	b	i	0.5 / 50% / 1/2;	1
4.	b	ii	<p><i>(If on the X chromosome)</i></p> <p>ALTERNATIVE 1 Father evidenced route:</p> <p>a. 1 has only one dominant allele on X (and not on the Y) / would be X^DY / OWTTE;</p> <p>b. 1 passed his X chromosome/dominant allele to 3/7 / OWTTE</p> <p>OR</p> <p>son/8 could not inherit the disease;</p> <p>c. (so) all daughters would be affected / not possible for 3/7 to be healthy / OWTTE;</p> <p>ALTERNATIVE 2 Mother evidenced route:</p> <p>d. 2 does not have the dominant allele / is homozygous recessive / would be X^dX^d / OWTTE;</p> <p>e. 2 passed her X chromosome/ X^d/recessive allele(s) to 6/8;</p> <p>OR</p> <p>6/8/sons would receive the Y chromosome with no (dominant) allele / OWTTE;</p> <p>f. (so) all sons/8 would be healthy / not possible for 8 to be affected / OWTTE;</p>	<p><i>Accept Punnett grids, providing they are clearly annotated and identify specific individuals.</i></p> <p>2 max</p>

Question		Answers	Notes	Total
5.	a	a. may kill useful species/pollinators; b. greater loss of biodiversity/species diversity OR greater disruption to food webs/chains;		1 max
5.	b	i	secondary consumer;	1
5.	b	ii	a. biomagnification/bioaccumulation; b. (insecticide) is not broken down / <i>OWTTE</i> ; c. (so) stored/accumulated/increased in organism/tissues/fat; d. (so) not excreted; e. birds eat large numbers of (large) fish OR animals at higher trophic levels eat animal below / (animals) receive/accumulates insecticide from the previous trophic level OR large numbers of organisms lower down with high insecticide level / <i>OWTTE</i> ;	3 max

Question		Answers	Notes	Total
6.	a	a. dendrite; b. receives impulse/signals/neurotransmitter from (adjacent) neuron OR conducts/passes impulses/signals towards cell body/neuron;		2 max
6.	b	a. calcium/ Ca^{2+} /Ca moves into the presynaptic membrane OR neurotransmitter/acetylcholine released from presynaptic membrane; b. (neurotransmitter) diffuses across the synapse/synaptic cleft; c. binds to transmembrane receptors/receptors in postsynaptic membrane; d. (protein) channels open/ Na^{+} /positive ions diffuse in; e. causes depolarization (of (post synaptic) membrane) / action potential / membrane potential increases;		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
7.	a	<p>a. each/one chromosome consists of (two genetically) identical chromatids OR sister chromatids are (genetically) identical OR replication (in interphase/S phase) produces two (genetically) identical DNA strands OR diploid cells contain two (genetically) identical copies of DNA;</p> <p>b. (DNA) condense/coil (in prophase) to form chromosomes OR (chromosomes/chromatids) attach to spindle fibres (in metaphase) OR (chromosomes/chromatids) align/place in the center/equator of the cell (in metaphase);</p> <p>c. microtubules contract/shorten OR (chromatids/chromosomes) are separated/pulled apart (in anaphase);</p> <p>d. (chromatids/chromosomes) move to/reach poles/ends of cell (in telophase) OR one (copy of each identical) chromatid/chromosome in each new/daughter cell;</p>		4 max

Question		Answers	Notes	Total
7.	b	<p>a. <u>RNA polymerase</u> unwinds/unzips DNA / breaks hydrogen bonds;</p> <p>b. (DNA) template/antisense strand is used;</p> <p>c. (free) RNA nucleotides added (to DNA);</p> <p>d. (by) <u>complementary</u> base pairing / A-U AND G-C;</p> <p>e. RNA polymerase joins/attaches (RNA) nucleotides (on new mRNA strand)/forms (phosphodiester) bonds;</p> <p>f. RNA polymerase/mRNA strand detaches/DNA strands reattach</p> <p>OR</p> <p>RNA polymerase reach the stop codon;</p>		4 max

Question		Answers	Notes	Total
7.	c	<p>a. arteries carry blood at high pressure AND veins carry blood at low pressure;</p> <p>Arteries</p> <p>b. narrow/small lumen to maintain high (blood) pressure;</p> <p>c. thick/outer layer/wall for strength/protection/support/withstands high pressure OR</p> <p>collagen in outer layer/wall for strength/ support/protection;</p> <p>d. muscle tissue to withstand high (blood) pressure/control diameter;</p> <p>e. elastic tissue/fibers that stretch AND recoil/spring back OR</p> <p>elastic tissue/fibers withstand/maintain (high) pressure/smooth out blood flow/allow blood to flow in pulses;</p> <p>Veins</p> <p>f. contain (pocket) valves to prevent backflow (of blood);</p> <p>g. thin/flexible walls that can be squeezed/flattened/compressed by (skeletal) muscle OR</p> <p>compression of thin/flexible walls assists flow/movement of blood;</p> <p>h. large lumen so less resistance to blood flow;</p> <p>Common</p> <p>i. smooth endothelium/lining to reduce friction/increase blood flow;</p>		7 max

Question		Answers	Notes	Total
8.	a	<p>a. LH stimulates progesterone production / ovaries/corpus luteum produce progesterone;</p> <p>b. (progesterone) inhibits FSH and LH;</p> <p>c. inhibition of FSH prevents follicles developing/maturing;</p> <p>d. inhibition of LH prevents ovulation/egg release (from ovary);</p> <p>e. maintains/increases thickness of endometrium/uterus lining;</p> <p>f. inhibition of FSH/LH is (an example of) <u>negative feedback</u>;</p> <p>g. if egg is not fertilized, progesterone level falls/corpus luteum degenerates</p> <p>OR</p> <p>if egg is fertilized, progesterone level remains high/does not fall/corpus luteum is maintained;</p>		4 max
8.	b	<p>a. PCR amplifies DNA/makes many copies of DNA;</p> <p>b. (DNA) heated to high temperatures to separate strands/break hydrogen bonds / denature;</p> <p>c. cooled/temperature lowered;</p> <p>d. use of primers (to identify DNA to be replicated) / primers bind (to DNA strands);</p> <p>e. Taq polymerase is heat-stable/does not denature at high temperatures;</p> <p>f. (Taq) polymerase joins nucleotides (on new DNA strands)/forms phosphodiester bonds;</p> <p>g. the process is repeated numerous times to produce sufficient DNA;</p>	<p><i>b. Both references to increased temperature and separation of strands are needed for this marking point.</i></p>	4 max

Question		Answers	Notes	Total
8.	c	a. plants/autotrophs use CO ₂ in <u>photosynthesis</u> ; b. plants/autotrophs release CO ₂ during <u>respiration</u> ; c. (CO ₂) converted to organic compounds/glucose/starch/cellulose/fat/protein; d. (transferred) to consumers/animals by feeding; e. consumers/animals/detritus feeders/heterotrophs release CO ₂ during <u>respiration</u> ; f. plants/animals die forming (dead) organic matter; g. saprotrophs/decomposers digest dead plants/animals; h. saprotrophs/decomposers release CO ₂ by <u>respiration</u> ; i. fossilization/incomplete decomposition produces fossil fuels/coal/oil/peat/gas OR anaerobic respiration releases methane/ruminant (cows) release methane; j. combustion of fossil fuels/plants/biomass releases CO ₂ ;	Accept annotated diagrams that clearly show the relevant marking points.	7 max