

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

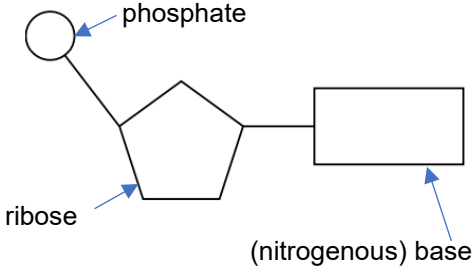
- ♦ Extended response questions for SLP2 carry a mark total of **[16]**. Of these marks, **[15]** are awarded for content and **[1]** for the quality of the answer.
- ♦ **[1]** for quality is to be awarded when:
 - ♦ the candidate's answers are clear enough to be understood without re-reading.
 - ♦ the 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.

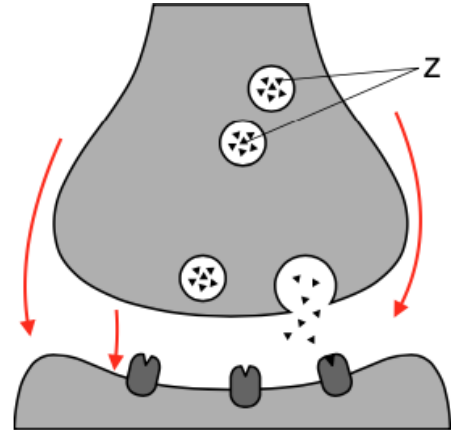
Candidates that score very highly on the content marks need not necessarily automatically gain **[1]** for quality (and *vice versa*).

Section A

Question			Answers	Notes	Total
1.	a		13.3;		1
1.	b		a. standard smooth-haired has the higher IVDD prevalence; b. standard smooth-haired has the higher age at onset;	<i>Accept vice versa for mpa and b. Do not accept raw data.</i>	2
1.	c		miniature (dachshunds), as two of the three sub-breeds show IVDD onset at an earlier (median) age than the corresponding standard version;	<i>Answer must take into account all of miniature compared to all of standard sub-breeds.</i>	1
1.	d		females neutered at less than 12 months;		1
1.	e		<u>6%</u> ;	<i>Units required. Allow 5.5 to 6.5 %.</i>	1

Question			Answers	Notes	Total
1.	f		<i>Similarities 2 max:</i> a. risk increases in both males and females when they are neutered OR unneutered have lower risk; b. risk is highest in both males and females when neutered before 12 months of age; c. for males and females unneutered have less variation/range than neutered OR both male and female neutered dogs may show no significant differences in their mean risk of IVDD (as suggested by overlapping error bars); <i>Differences 2 max:</i> d. neutered males have a lower risk than neutered females OR neutered females have a higher risk than neutered males; e. unneutered males have a higher risk than unneutered females OR unneutered females have a lower risk than unneutered males; f. data is more variable in females;	2 max for similarities. 2 max for differences.	3 max
1.	g		a. standard wire-haired unneutered female; <i>From the table</i> b. as standard wire-haired dachshunds have the lowest prevalence of IVDD; c. as standard wire-haired dachshunds have the highest age of IVDD onset; <i>From the graph</i> d. unneutered females have lower risk than unneutered males; e. unneutered has the lowest risk OR both male and female show lowest risk when unneutered or neutered after 12 months;	<i>For full marks, one marking point from table and one from graph are required.</i>	3 max

Question	Answers	Notes	Total
2. a	a. <u>ribose</u> drawn as a pentagon and labelled; b. base linked correctly (to C1) of ribose and labelled; c. phosphate linked correctly (to C5) of ribose and labelled; 	<i>Diagram using circles, pentagons and rectangles to represent phosphates, ribose sugar and base</i> <i>Allow a named/abbreviation of a base. Any base other than thymine/T.</i> <i>Do not accept deoxyribose or pentose sugar.</i>	3 max
2. b	a. twenty/different amino acids (are coded for in the genetic code); b. amino acids can be linked in any order/sequence in the polypeptide chain; c. polypeptide chains can have any number of amino acids;		2 max
2. c	a. mRNA provides/makes a copy of the code from DNA; b. mRNA takes message from nucleus to cytoplasm; c. mRNA binds to (the small subunit of) the <u>ribosome</u>; d. mRNA codons have complementary bases to tRNA; e. mRNA codons code for a specific amino acid;		3 max

Question			Answers	Notes	Total
3.	a		cells that can divide/proliferate and differentiate along different pathways;		1
3.	b		a. location of stem cells includes bone marrow/hair follicles/brain/skin/muscles; b. (stem cells) are surrounded by supporting cells/niche OR the stem cell niche can maintain the cells OR or promote their proliferation and differentiation; c. (stem cells) can repeatedly divide (by mitosis); d. (stem cells) can become specialized to repair/maintain organs/tissues OR verified example of specialized cells; e. adult (stem) cells can differentiate into limited cell types/multipotent/pluripotent;	Accept other verified examples for mpa.	3 max
4.	a		arrow drawn from presynaptic neuron to postsynaptic neuron;	 [Source: Nrets. https://commons.wikimedia.org/wiki/File:Synapse_Illustration2_tweaked.svg. Licensed under CC BY-SA 3.0 http://creativecommons.org/licenses/by-sa/3.0/.]	1

Question			Answers	Notes	Total
4.	b		neurotransmitter / named example of neurotransmitter;		1
4.	c		a. depolarization/action potential/impulse causes calcium/ Ca^{2+} to diffuse/move into presynaptic neuron; b. which causes synaptic vesicles to move towards (presynaptic neuron) membrane; c. causes synaptic vesicles to fuse with membrane of (presynaptic) neuron OR (and) release neurotransmitter into the synaptic cleft/exocytosis;		2 max
5.	a		buoyancy;	<i>Do not give a mark for surface tension.</i>	1
5.	b		a. animals may get entangled in plastic; b. macroplastics can be ingested as food; c. consequences of a. or b; e.g. • block their gut • prevent swimming • cause suffocation • cause choking • result in death d. reduce feeding OR less energy for growth/reproduction; e. bioaccumulation/biomagnification occurs when macroplastics are physically degraded into microplastics;	<i>Accept other verified example.</i>	2 max

Question			Answers	Notes	Mark
5.	c		a. increased water temperature stress corals; b. symbiotic algae/zooxanthellae are expelled from (stressed) corals; c. (higher temperature) leads to coral bleaching; d. bleached corals are more susceptible to disease OR bleached corals lack a source of nutrition (from photosynthesis);	<i>Mpc: Do not accept that pH change leads to coral bleaching.</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		<i>Starch</i> a. starch is an (efficient) energy storage molecule; b. starch is compact in structure due to coiling and branching OR starch is relatively insoluble due to large molecular size OR starch has alpha-glucose monomers (added or removed easily); <i>Cellulose</i> c. cellulose contributes to the stability/strength/structural function of the plant cell wall OR cellulose provides fiber for humans who lack the enzyme to digest; d. cellulose has beta-glucose monomers resulting in straight chains OR cellulose has alternate monomers resulting in straight chains;	<i>Marking points a and c are for function and marking points b and d are for structure.</i>	4 max

Question			Answers	Notes	Total
6.	b		a. plants rely on light to drive photosynthesis; b. trees maximize height to reach sunlight above other plants; c. lianas/vines (germinate on the ground but) use tree trunks for support to gain height; d. epiphytes / plants that grow high up in tree branches to access light; e. strangler epiphytes germinate in the canopy and grow upwards to reach light, strangling and killing the original tree; f. shade-tolerant plants/shrubs are adapted to absorb limited range of light wavelength OR shade-tolerant plants/shrubs are adapted to absorb limited amount of light; g. larger leaves/more chloroplasts to harvest light OR shrubs grow laterally, increasing the surface area to absorb light OR leaves are arranged to maximize light absorption/minimize shading;		4 max

Question			Answers	Notes	Total
6.	c		a. there is variation among members of a population; b. mutations/sexual reproduction/crossing over cause variation; c. selection pressures OR changes in the environment occur; d. some members of the population will be more suited to the environment than others; e. species produce more offspring than the environment can support; f. leading to competition; g. individuals that are well-adapted/fitter survive and reproduce; h. well-adapted individuals pass on characteristics to their offspring; i. this increases the frequency of characteristics/alleles that make individuals better adapted; j. therefore, leading to changes within the species;	<i>Mp g and h: Accept vice versa.</i>	7 max

Question			Answers	Notes	Total
7.	a		a. both parents are heterozygous/carry one recessive allele; b. 50% chance of each parent passing on the recessive allele OR 50% chance of each parent passing on the dominant allele; c. 25% chance of homozygous recessive genotype in offspring OR 75% chance that offspring do not have cystic fibrosis; d. homozygous recessive results in cystic fibrosis; e. 50% chance of heterozygous genotype/carrier in offspring;	<i>Marking points can be shown in an annotated Punnett grid.</i> <i>Mp d: OWTTE</i>	4 max
7.	b		a. mucous membranes are barriers/primary/first defence against pathogens; b. secrete mucus (to maintain moisture); c. mucus (is sticky and) traps pathogens; d. (mucus traps pathogens) so they can be expelled; e. mucus expelled from respiratory system by coughing OR expelled out by cilia; f. mucus swallowed (into stomach which contains acid to kill pathogens); g. mucus contains enzymes/lysozymes which destroy pathogens;		4 max

Question			Answers	Notes	Total
7.	c		<i>Alveoli</i> a. alveoli increase/large surface area for gas exchange; b. alveoli are thin/one cell thick to reduce distance for diffusion; c. surfactant creates a moist surface to reduce surface tension / allows oxygen to dissolve / stop alveoli from sticking together; d. network/extensive/many/ of capillaries around the alveoli allow diffusion of gases; e. inspiration maintains concentration gradient between the alveoli and the blood OR blood flow maintains concentration gradient between the blood and alveoli; <i>Ventilation</i> f. (during inspiration) diaphragm contracts/flattens; g. (external) intercostal muscles contract and move rib cage up and out; h. increasing volume of thorax; i. lowering air pressure in lungs; j. air travels/flows into lungs; k. oxygen diffuses from alveoli to capillaries and carbon dioxide diffuses from capillaries to alveoli;	<i>Mp g: Do not accept internal intercostal muscles</i>	7 max