

Markscheme

May 2019

Biology

Standard level

Paper 2

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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 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.

Section A

Question		Answers	Notes	Total
1.	a	10–25 «%» ✓		1
1.	b	G1 always respond more than 25% «except control», while G2 and G3 always respond 25% or less ✓ G1 always responds more than G2 and G3/all of the others ✓	OWTTE	1
1.	c	oscilloscope ✓		1
1.	d	mouse chemicals cause action potentials «in all six neurons» while control ones cause none «remain in resting potential»/mouse chemicals cause greater responses ✓	OWTTE	1
1.	e	a. both chemicals cause action potentials OR both chemicals respond in the majority of/five/most neurons ✓ b. stoat scent causes a higher action potential/longer/bigger response than mouse alarm compound «in each neuron» OR neuron 2 reacts strongly to the stoat scent but has a minimal/no response to the mouse alarm compound ✓		2

(continued...)

(Question 1 continued)

Question		Answers	Notes	Total
1.	f	<p>a. there is a <u>positive</u> relationship/correlation between the size of neural traces and the percentage of responding G1 neurons OR the chemicals that cause stronger/higher neural traces also cause the greatest percentage of responding G1 neurons ✓</p> <p>b. fox and stoat scents have «approximately» the same/similar neural traces and the same percentage of responding neurons/>75 % ✓</p> <p>c. mouse alarm compounds cause smaller neural traces and smaller percentage of responding neurons/25–75 % ✓</p> <p>d. control chemicals have <u>no response</u> in both cases OR <u>no percentage</u> of «G1 neurons» response and no action potential «in neural traces» ✓</p>	<p><i>Accept vice versa.</i></p>	<p>2 max</p>
1.	g	<p>the mice would have the same response to another mouse’s danger signal as to the actual presence of the predator/fox OR adaptation to fool predator by producing a scent similar to predator’s own scent OR allows a group response to a predator/fox/danger when just one mouse detects the danger ✓</p>	<p><i>Accept any other feasible answer.</i></p>	<p>1 max</p>

(continued...)

(Question 1 continued)

Question		Answers	Notes	Total
1.	h	<p>the aphids that were fed on wild-type thale cress/W as they had 80 % «or more» repelled each generation/ always had the higher % response</p> <p>OR</p> <p>the aphids that fed on wild-type thale cress plants/W of G3 as they had «about» 85 % repelled/had the higher % response ✓</p>	<p><i>Answer should refer to a percentage.</i></p>	1
1.	i	<p>a. «over the generations» fewer are repelled by EBF ✓</p> <p>b. «over the generations» more are attracted to EBF ✓</p> <p>c. by G3 a «slight» increase in no choice ✓</p> <p>d. aphids respond less to EBF/alarm compound if they feed on plants that produce it/exposed to it constantly ✓</p> <p>e. mutant aphids with attraction to transgenic plants can arise from aphids with no attraction or repulsion to transgenic plants</p> <p>OR</p> <p>aphids with no attraction or repulsion to transgenic plants may produce new type of aphids with attraction to transgenic plants ✓</p>		2 max

(continued...)

(Question 1 continued)

Question		Answers	Notes	Total
1.	j	<p>a. mutant aphids/varieties may be indifferent to/attracted to transgenic plants as these do not present a hazard «not favour» ✓</p> <p>b. initially/for limited time the plants would thrive as the aphids would be «largely» repelled and thus not eat the plants «so natural selection would favour them» ✓</p> <p>c. over time/in a few generations, the aphids population become more resistant/more attracted/less repelled to EBF and return to feed on the plants so long-term benefit very limited «so natural selection would not favour them» ✓</p> <p>d. the aphids resistant to EBF would not respond to other aphid alarms and «likely» be more readily eaten by predators «so the long-term benefit to plants could be supported by natural selection» ✓</p>	<p><i>The answers must indicate whether natural selection would support or not for each statement.</i></p>	<p>2 max</p>

Question		Answers	Notes	Total
2.	a	<p>telophase because the chromosomes/chromatids have reached the poles OR «late» anaphase as some chromosomes/chromatids are still moving/tails visible ✓</p>	OWTTE	1
2.	b	<p>a. is a photograph/diagram of homologous pairs of chromosomes that can be analysed ✓ b. information may be used to determine other chromosome abnormalities/changes in chromosome numbers/possible birth defects ✓ c. Down syndrome/trisomy can be detected if there are three copies of a chromosome OR accept any other valid example ✓ d. other missing or extra pieces of chromosomes can be detected ✓ e. sex can be determined as the Y chromosome is shorter than the X ✓</p>	<p><i>Not just "Down syndrome".</i></p> <p><i>Or correct ref to X and Y.</i></p>	3 max

Question			Answers	Notes	Total
3.	a	i	a. «cell» respiration/loss of CO ₂ /biomass consumed to provide/as a source of energy ✓ b. loss of energy «as heat» between trophic levels means less energy available for building biomass ✓ c. waste products «other than CO ₂ »/loss of urea/feces/egesta ✓ d. material used/CO ₂ released by saprotrophs ✓ e. undigested/uneaten material «teeth, bones, etc»/detritus buried/not consumed OR formation of peat/fossils/limestone ✓		2 max
3.	a	ii	a. increased CO ₂ flux to the atmosphere due to increased burning of fossil fuels by industry/transportation / cement production ✓ b. «land use change leading to» decreased rate of forest burning OR better fire suppression leading to decrease in CO ₂ release OR example of land use changes that uses less fossil fuel OR increase in land covered by forests/plants / forests recovering from historical forestry OR any other reasonable explanation of land use change that would lead to decreased rate of carbon flow to atmosphere ✓ c. carbon storage in land decreased as less photosynthesis due to fewer forests/more construction OR release of methane due to «drying of» wetlands/sealing of land with concrete/buildings/roads ✓ d. carbon storage in ocean increased due to more photosynthesis/algae/greater concentration of CO ₂ in the atmosphere OR increased diffusion/rate of dissolving of CO ₂ into ocean from the atmosphere OR limestone/carbonate accumulation «more snails» ✓		3 max

continued...)

(Question 3 continued)

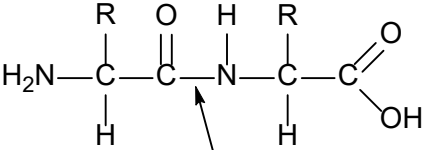
Question		Answers	Notes	Total
3.	b	<p>a. individuals in a population will show a variation of adaptations to climate change ✓</p> <p>b. organisms that resist temperature changes OR current changes of the ocean/melting ice/more acidity/changes in food chains will survive better ✓</p> <p>c. reproduce more and pass on their characteristics ✓</p> <p>d. organisms with less adaptation will disappear with time ✓</p> <p>e. example «eg polar bears have less ice to be able to catch prey/seals and are starving the ones that manage to find other food sources will survive» OWTTE ✓</p> <p>f. changes will occur within species OR new species may appear «over time» ✓</p>	<p><i>Accept any valid example of an Arctic ocean organism.</i></p>	<p>3 max</p>

Question		Answers	Notes	Total												
4.	a	X: Filicinophyta ✓ Y: Coniferophyta/Conifera/Gymnosperms ✓		2												
4.	b	<table border="1"> <tr> <td>mpa</td> <td>mpb</td> </tr> <tr> <td>radiation/mutagenic chemicals ✓</td> <td>can increase mutation rate/frequency of mutations ✓</td> </tr> <tr> <td>OR</td> <td>OR</td> </tr> <tr> <td>radiation/mutagenic chemicals ✓</td> <td>can affect nucleotides/bases in DNA ✓</td> </tr> <tr> <td>OR</td> <td>OR</td> </tr> <tr> <td>errors in replicating DNA ✓</td> <td>may cause changes in protein functions in some cells ✓</td> </tr> </table>	mpa	mpb	radiation/mutagenic chemicals ✓	can increase mutation rate/frequency of mutations ✓	OR	OR	radiation/mutagenic chemicals ✓	can affect nucleotides/bases in DNA ✓	OR	OR	errors in replicating DNA ✓	may cause changes in protein functions in some cells ✓	<i>Not chromosomal.</i>	2 max
mpa	mpb															
radiation/mutagenic chemicals ✓	can increase mutation rate/frequency of mutations ✓															
OR	OR															
radiation/mutagenic chemicals ✓	can affect nucleotides/bases in DNA ✓															
OR	OR															
errors in replicating DNA ✓	may cause changes in protein functions in some cells ✓															
4.	c	a. a clade is a group of organisms that have evolved from a common ancestor ✓ b. identify the base sequences of a gene ✓ c. identify amino acid sequence of a protein ✓ d. comparing homologous structures ✓ e. the fewer the differences, the closer they diverged in time from a common ancestor ✓	<i>Accept vice versa.</i>	3 max												
4.	d	Vombatidae/wombats ✓		1												

Question		Answers	Notes	Total
5.	a	<p>a. simple diffusion is passive movement of molecules/ions along a concentration gradient ✓</p> <p>b. facilitated diffusion is passive movement of molecules/ions along a concentration gradient through a protein channel «without use of energy» ✓</p> <p>c. osmosis is the passage of water <u>through a membrane</u> from lower solute concentration to higher ✓</p> <p>d. active transport is movement of molecules/ions <u>against the concentration gradient</u> «through membrane pumps» with the use of ATP/energy ✓</p> <p>e. endocytosis is the infolding of membrane/formation of vesicles to bring molecules into cell with use of energy OR exocytosis is the infolding of membrane/formation of vesicles to release molecules from cell with use of energy ✓</p> <p>f. chemiosmosis occurs when protons diffuse through ATP synthase «in membrane» to produce ATP ✓</p>	<p><i>The description of each type of transport should include the name and brief description.</i></p> <p><i>mpa, mpb and mpc require reference to concentration.</i></p> <p>OWTTE</p> <p><i>Active transport requires mention of the use of energy.</i></p>	4 max

(continued...)

(Question 5 continued)

Question		Answers	Notes	Total
5.	b	<p>a. two amino acids, one with NH₂/NH₃⁺ end and one with COOH/COO⁻ end ✓</p> <p>b. peptide bond between C=O and N—H correctly drawn ✓</p> <p>c. «chiral» C with H and R group on each amino acid ✓</p> <p>d. peptide bond labelled/clearly indicated between C terminal of one amino acid and N terminal of the second amino acid ✓</p>	 <p>candidate may indicate peptide bond here</p> <p><i>Labels not required for amino group and carboxyl group.</i></p>	3 max

(continued...)

(Question 5 continued)

Question		Answers	Notes	Total
5.	c	<p>a. enzymes catalyse/speed up chemical reactions/lower the energy needed ✓</p> <p>b. have specific <u>active sites</u> to which specific substrates bind ✓</p> <p>c. enzyme catalysis involves molecular motion and the collision of substrates with the active site ✓</p> <p>d. enzymes break macromolecules into monomers/smaller molecules in digestion ✓</p> <p>e. smaller molecules/monomers more readily absorbed ✓</p> <p>f. <<pancreas>> secretes enzymes into the «lumen of» small intestine ✓</p> <p>g. the small intestine has an alkaline pH ✓</p> <p>h. enzymes have maximum action at specific pHs OR enzymes can be denatured at other pHs ✓</p> <p>i. amylase breaks down starch into sugars/disaccharides ✓</p> <p>j. lipase breaks lipids/triglycerides into monoglycerides/fatty acids and glycerol ✓</p> <p>k. endopeptidase/protease breaks «peptide» bonds in proteins/polypeptides ✓</p> <p>l. accept any other valid pancreatic enzyme, substrate and product ✓</p>	<p>Award [6 max] if there is no mention of two specific groups of enzymes.</p> <p>OWTTE</p> <p>OWTTE</p>	8 max

Question		Answers	Notes	Total
6.	a	a. eukaryotes evolved from prokaryotes ✓ b. prokaryotes engulfed other prokaryotes without digesting them ✓ c. engulfed aerobic cell/prokaryote became mitochondria ✓ d. engulfed photosynthetic cell/ prokaryotes became chloroplasts ✓ e. these organelles have a double membrane «due to the engulfing process» ✓ f. mitochondria/chloroplasts contain DNA/small ribosomes/70S ribosomes ✓		3 max
6.	b	a. solar/light energy is converted to chemical energy ✓ b. energy needed to produce glucose ✓ c. only specific wavelengths are absorbed by chlorophyll OR red and blue absorbed most strongly. OR chlorophyll is the pigment that absorbs light energy ✓ d. H ⁽⁺⁾ /electrons from water are used to reduce compounds ✓ e. CO ₂ is absorbed/used/reduced to produce carbohydrates ✓ f. correct word/ <u>balanced</u> symbol equation of photosynthesis ✓	Accept correct reference to NADPH/ATP from AHL.	4 max

(continued...)

(Question 6 continued)

Question		Answers	Notes	Total
6.	c	<p><i>control: [6 max]</i></p> <p>a. homeostasis is the maintenance of a constant internal environment ✓</p> <p>b. the pancreas produces hormones that control the levels of glucose ✓</p> <p>c. if glucose levels in blood are high, beta-cells «of the pancreas» produce insulin ✓</p> <p>d. «insulin» causes the cells to take up /absorb glucose ✓</p> <p>e. liver stores excess glucose as glycogen ✓</p> <p>f. if glucose levels in blood are low, alpha-cells «of the pancreas» produce glucagon ✓</p> <p>g. «glucagon» causes the liver to break down glycogen into glucose ✓</p> <p>h. «glucagon» increase levels of glucose in the blood ✓</p> <p>i. negative feedback controls the glucose levels ✓</p> <p><i>consequences:</i></p> <p>j. if the pancreas produces little/no insulin a person can develop <u>type I</u> diabetes ✓</p> <p>k. a person with <u>type I</u> diabetes «usually» needs/is dependent on injections of insulin ✓</p> <p>l. <u>type II</u> diabetes occurs when the body becomes resistant to insulin/cells do not respond to insulin ✓</p> <p>m. <u>type II</u> diabetes can «sometimes» be controlled by diet and exercise ✓</p> <p>n. named consequence of having diabetes «eg: eye damage» ✓</p>	<p><i>Award [6 max] if no consequences are given.</i></p> <p>OWTTE</p>	8 max