

Markscheme

November 2021

Biology

Standard level

Paper 2

14 pages

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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.

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

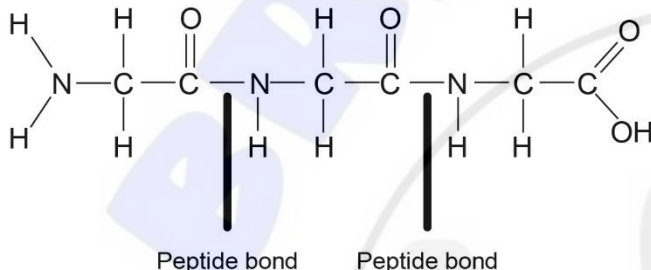
Section A

Question			Answers	Notes	Total
1.	a	i	Capricorn and Bunkers group;		1
	a	ii	there is no clear trend;		1
	b	i	a. effects (generally) increase with temperature anomalies/WSSTA; b. effects increase for all different coral covers OR in the 25-49 cover there is an anomaly/is not an increasing trend; c. harmful effect is higher in coral covers between 50-75% / vice versa;		2 max
	b	ii	50% / 25% / 49% OR 25-49% (coral cover);		1
	b	iii	a. the closer the corals are (to each other) the easier the transmission; b. other organisms in the community may act as vectors/carriers / OWTTE;		1 max
	c	i	Similarities a. similar range of cover in both periods OR weak correlation/no correlation in either; Differences b. higher WSSTA range/more WSSTA in 1998–1999 than 2002–2003 OR positive (2002-3) versus negative correlation (98-99) OR more coral reefs with very low % of coral cover (0-20%) in 2002-2003;	<i>Must respond with one similarity and one difference for full marks</i>	2 max
	c	ii	coral cover lower on reefs with higher temperature;		1

(continued...)

(Question 1 continued)

Question		Answers	Notes	Total
1.	d	a. corals would not be able to maintain their skeletons; b. (if coral reefs are lost) habitat will be lost; c. some organisms/coral can decline if the water becomes too acidified; d. coral bleaching could occur/become worse OR coral could expel their mutualistic alga/zooxanthellae; e. enzymes could be denatured;		3 max
	e	real environmental conditions / larger scale investigations / more variables studied;		1

Question		Answers	Notes	Total
2.	a	<p>circle/bracket around peptide bond / arrow pointing to peptide bond / peptide bond labelled;</p>  <p style="text-align: center;">Peptide bond Peptide bond</p>	<p><i>Allow either peptide bond</i></p> <p><i>Allow if adjacent C=O and NH groups are included in the circle/bracket, but do not allow if other parts of the molecule are included</i></p>	1
	b	<p>a. Rubisco fixes CO₂ from atmosphere during photosynthesis; b. insulin controls blood glucose levels; c. collagen forms connective tissue/ligaments; d. spider silk forms the spider web; e. rhodopsin involved in photoreceptor; f. immunoglobulins/antibodies attach to antigens/pathogens; g. actin/myosin performs muscle contraction; h. hemoglobin carries oxygen in red blood cells;</p>	<p><i>Accept any other correct three named proteins</i></p> <p><i>If an enzyme is named, the correct substrate must be stated</i></p>	3 max
	c	<p>contracts/flattens/becomes less domed/increases volume of thorax;</p>		1

Question		Answers		Notes	Total	
3.	a			<p><i>Accept not autotrophic/not photosynthetic instead of heterotrophic.</i></p> <p><i>Do not accept that both groups are decomposers or consumers for the similarity.</i></p>	2	
			Detritivores			Saprotrophs
		Similarity	heterotrophic OR feed on/obtain nutrients from dead organic matter/dead organisms;			
		Difference	internal digestion/digestion in gut OR enzymes secreted into gut OR food ingested before digestion	external digestion OR enzymes secreted into surroundings OR food digested before being absorbed;		
	b	i	food chain of three or more organisms <u>starting with plants</u> ;		1	
	b	ii	a. energy is lost between the trophic levels; b. transfer between levels is only usually 10% efficient OR energy transformations take place in living organisms / the process is never 100% efficient; c. energy is lost by the organism/used in respiration / released as heat/movement; d. energy is lost as waste/feces/urine/undigested food/uneaten parts; e. as energy is lost between trophic levels and so (higher ones) have less biomass / less biomass available for next level;		3 max	

(continued...)

(Question 3 continued)

Question		Answers	Notes	Total
3.	c	<p>a. the rate of reaction will be limited by the limiting factor that is nearest to its minimum value;</p> <p><i>temperature:</i></p> <p>b. enzymes that control photosynthesis are influenced by temperature;</p> <p>c. as temperature increases, reaction rate will increase;</p> <p>d. above a certain temperature, the rate of photosynthesis will decrease;</p> <p>e. (where temperature is limiting) essential enzymes begin to denature/not working to optimum;</p> <p><i>light intensity:</i></p> <p>f. light is source of energy / converted into chemical energy;</p> <p>g. as light intensity increases reaction rate will increase;</p> <p>h. at a certain light intensity, rate of photosynthesis will plateau;</p> <p>i. another factor becomes limiting;</p> <p><i>CO₂ concentration:</i></p> <p>j. CO₂ is fixed to form organic molecules;</p> <p>k. as CO₂ concentration increases, reaction rate will increase;</p> <p>l. at a certain concentration of CO₂, rate of photosynthesis will plateau;</p> <p>m. another factor becomes limiting;</p>	<p><i>Accept answers using an <u>annotated</u> graph to explain</i></p> <p><i>Only accept the first factor described</i></p> <p><i>Do not accept pH as a limiting factor</i></p>	3 max
	d	<p>a. mutations;</p> <p>b. meiosis/crossing over/random assortment of homologous pairs;</p> <p>c. sexual reproduction/recombination/random fertilisation;</p>		1 max

Question			Answers	Notes	Total
4.	a		a. arteries carry blood at high pressure; b. rupture of arteries is prevented by thick muscular/elastic walls; c. narrow lumen to maintain a high blood pressure; d. elastic tissue allows artery to stretch and recoil (to even out pressures); e. arteries have muscle layers which contract to increase/control the blood flow; f. folding in the endothelium allows stretching OR smooth endothelium reduces friction;		3 max
	b	i	(cell) respiration/photosynthesis;		1
	b	ii	source of energy (for use in the cell) OR example of use of ATP OR when ATP is converted to ADP + Pi (is hydrolyzed) the energy stored in the phosphate bond is released to be used by the cell;		1
	c		increases heart rate OR prepares the body for action;		1 max

Section B

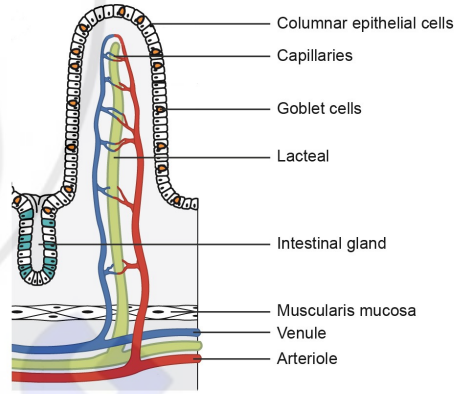
Clarity of communication: [1]

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
5	a	a. surface area of the cell affects the rate of material exchange; b. when the cell increases in size, so does its chemical activity/metabolism; c. (when the cell increases in size/grows) more substances need to be taken in / more waste products need to be excreted; d. as the volume of the cell increases, so does the surface area, however not to the same extent OR when the cell gets bigger, its surface area to volume ratio gets smaller; e. substances will not be able enter the cell fast enough/cell volume will not be supplied OR metabolic rate will exceed the rate of exchange OR when the surface area:volume ratio is higher, the diffusion rate increases; f. some cells have adaptations to increase their surface area/flatten/microvilli/shape of red blood cells; g. cells in growth areas tend to divide and remain small OR cells divide when maximum size is reached;		4 max

(continued...)

(Question 5 continued)

Question		Answers	Notes	Total
5.	b	<p>a. form of diffusion;</p> <p>b. osmosis is the movement of water molecules;</p> <p>c. (movement) across a <u>selectively/semi/partially permeable</u> membrane/cell membrane;</p> <p>d. from a region of low <u>solute</u> concentration to a region of high <u>solute</u> concentration (until equilibrium is reached)</p> <p>OR</p> <p>movement of <u>water</u> molecules from a high concentration of <u>water</u> to a low concentration of water molecules;</p> <p>e. it is a passive transport mechanism/does not use ATP;</p> <p>f. channel proteins/aquaporins are used;</p>		4 max
	c	<p>a. small intestine is where nutrients are absorbed into the <u>bloodstream</u>;</p> <p>b. very long to maximize absorption;</p> <p>c. (the small intestine) is lined with (smooth) muscle to allow for the mixing/ <u>and</u> moving of digested food;</p> <p>d. muscles are circular <u>and</u> longitudinal;</p> <p>e. that perform peristalsis;</p> <p>f. the pancreas (and gall bladder) secretes substances into the small intestine to aid digestion;</p> <p>g. contain villi, to <u>increase surface area</u>;</p> <p>h. villi have microvilli to increase surface area even more;</p> <p>i. villi absorb products of digestion/mineral ions/vitamins/glucose;</p> <p>j. dense capillary network rapidly transports absorbed products;</p> <p>k. lacteal absorbs lipids from the intestine (into the lymphatic system);</p> <p>l. (most of the) chemical digestion (into monomers) occurs in small intestine/description of specific enzyme action;</p>	<p><i>Accept annotated diagrams as part of the explanation.</i></p>  <p>[Source: © 1999–2022, Rice University. Except where otherwise noted, textbooks on this site are licensed under a Creative Commons Attribution 4.0 International License https://creativecommons.org/licenses/by/4.0/. Image available at https://openstax.org/books/anatomy-and-physiology/pages/23-5-the-small-and-large-intestines?query=villus&target=%7B%22type%22%3A%22search%22%2C%22index%22%3A0%7D#fs-id1272744]</p>	7 max

Question		Answers	Notes	Total
6.	a	a. theory that eukaryotic cells evolved from prokaryotes OR origin of eukaryotic organisms based on some organisms living inside/engulfed by other organisms OR prokaryotic cell engulfed another prokaryote including it in cytoplasm without digesting it; b. mitochondria/chloroplasts have double membranes; c. mitochondria/chloroplasts have their own DNA/loop of DNA/naked DNA; d. mitochondria/chloroplasts have similar size to prokaryotes; e. mitochondria/chloroplasts can reproduce by binary fission; f. mitochondria/chloroplasts have 70S ribosomes (same as prokaryotes);		4 max

(continued...)

(Question 6 continued)

Question		Answers	Notes	Total
6.	b	a. chromosome number is halved so the zygote/offspring has same number as the parent / so that chromosome number is not doubled; b. process is meiosis; c. DNA/chromosomes replicate (so each chromosome consists of two chromatids); d. homologous chromosomes pair in prophase I; e. (these) separate in anaphase I into two cells; f. (after meiosis I) cells are haploid; g. in meiosis II chromatids are separated; h. result is <u>four</u> haploid cells/gametes; i. each gamete is genetically unique; j. (uniqueness) is due to crossing over/independent assortment/random alignment of chromosomes; k. fertilization results in the formation of a diploid zygote; l. (fertilization) results in variation in a population		7 max

(continued...)

(Question 6 continued)

Question		Answers	Notes	Total
6.	c	a. the binomial system of names for species is universal among biologists OR named according to a globally recognized scheme; b. allows to classify organisms into groups based on similar characteristics/common ancestry/DNA; c. every species is given a binomial name; d. members of the same species can mate and reproduce fertile offspring e. genus is written first, followed by species; f. genus is capitalized, (followed by) species is lower case OR an <u>underlined</u> correct example/stated that it must be underlined or italicized;		4 max

References:

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