

Markscheme

November 2020

Biology

Standard level

Paper 2

10 pages

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Section B

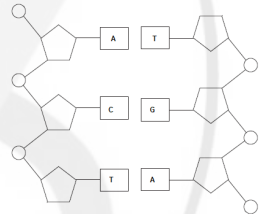
Extended response questions - quality of construction

- 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		Answer	Notes	Total
1	a	a. energy is not changed (between the two diets); b. study diet <u>slightly</u> lower in energy than habitual diet (but means/SD overlap); c. spread of values show more variation for habitual diet / higher SD in habitual;		1 max
	b	a. they differ in percent of saturated and unsaturated fats (but not total fat); b. percent of saturated fats is higher in study diet / lower in habitual diet; c. (mono/poly) unsaturated fats decreased in study diet compared to habitual diet/more in habitual diet OR polyunsaturated fats in study diet only half of what they were in habitual diet; d. (slightly) less carbohydrate in study;	<i>Allow numerical points if they are a valid comparison using distinguishing terms.</i>	2 max
	c	$((165-150) \div 150) \times 100;$ (=) 10 (%);	<i>Allow up to 167 = 11.3% 1 mark for correct working if above 167.</i>	2
	d i	a. both show same pattern of rise, level and then decrease / show same trend; b. both show same/similar levels of insulin (at all times) due to overlapping error bars; c. both rise for 30/45 minutes;	<i>Do not give credit for contrasts.</i>	2 max
	d ii	<u>β cells</u> of pancreas/islets (of Langerhans);		1
	d iii	as blood glucose rises, <u>insulin rises/increases</u> to reduce the level/ <i>OWTTE</i> ;	<i>Blood glucose must be mentioned as well as a rise in insulin.</i>	1
	e	<i>Hypothesis is partially supported</i> a. Increased saturated fats in study diet resulted in increase in cholesterol levels; b. cholesterol level is risk for blockage of coronary arteries; <i>Hypothesis is not supported</i> c. high insulin levels are sign of (Type II) diabetes; d. insulin levels were the same in both diets so no increased risk; e. study only 2 weeks long;		3 max

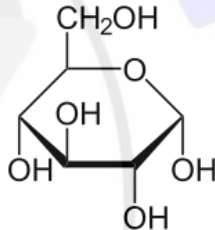
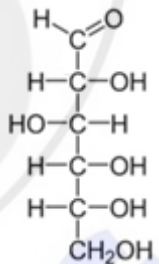
Question			Answer	Notes	Total
2	a	i	<i>Paramecium</i>		1
	a	ii	eukaryotes		1
	b		<u>heterotroph/consumer</u> as it feeds on bacteria/algae/yeast/smaller single celled organisms OR <u>heterotroph/consumer</u> as it does not have chloroplasts	<i>Heterotrophic must be qualified.</i>	1
	c		a. lives in fresh water so water enters cell (by osmosis); b. <u>contractile vacuoles</u> collect and expel water; c. homeostasis is keeping internal conditions within limit/constant / involves osmoregulation/regulating water content/potential;		2 max
	d		a. mitochondria/chloroplasts show features in common with <u>prokaryotes</u> /similar size; b. multiply by binary fission/in same manner; c. have naked loop of DNA/circular DNA/own DNA; d. surrounded by a double membrane;		3 max

Question		Answer	Notes	Total
3	a	a. part hydrophobic/not attracted to water/non-polar AND part hydrophilic/attracted to water/polar; b. bilayer formed (formed naturally by phospholipids in water); c. <u>hydrophilic</u> heads/parts face outwards AND <u>hydrophobic</u> tails/parts face inwards;	<i>Both needed.</i> <i>Do not allow water loving/hating in mpa or mpc.</i>	2 max
	b	i	synapse/synaptic	1
	b	ii	a. depolarization of pre-synaptic membrane / action potential/nerve impulse arrives; b. uptake of calcium / calcium ions diffuse in / calcium channels open; c. structures containing neurotransmitter/vesicles move to/fuse with membrane; d. <u>neurotransmitter/acetylcholine</u> released by exocytosis into cleft/binds to postsynaptic membrane/receptors;	3 max
4	a	a. correct base sequence: T, G, A; b. strand drawn anti-parallel; c. correct shapes used;	 <p><i>Award [2 max] if bonds are not from the correct carbon or if the nucleotides are not joined.</i></p>	3
	b	i	change in genetic makeup/DNA/nucleotide/base sequence	1
	b	ii	a. mutations cause variation among organisms of same species/population; b. some variations/mutations make individual more suited to its environment/way of life; c. individuals that are better adapted survive and produce offspring; d. individuals pass on genetic characteristics/mutation/variation to offspring; e. natural selection increases frequency of characteristics/alleles that make individuals better adapted;	4 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	<p>a. hexagonal ring structure with O at one point (between C1 and C5); b. correct orientation of OH groups (on carbons 1 to 4); <i>Hydrogens not required</i> c. CH₂OH group shown on fifth carbon with correct orientation;</p> <p>OR</p> <p>d. 6 carbon chain with oxygen on first C; e. H and OH groups correctly orientated;</p>	<p>Carbons do not need to be numbered. Allow boat or chair diagrams.</p>  <p>OR</p>  <p>Allow [2 max] if linear structure drawn.</p>	3

(continued.)

(Question 5 continued)

Question	Answers	Notes	Total
b	a. occurs by the process of photosynthesis; b. occurs in chloroplasts of plant cells/using chlorophyll; c. chlorophyll absorbs red/blue light AND reflects green light; d. raw materials/starting products are carbon dioxide and water/shown in an equation; e. water is split by photolysis; f. oxygen is produced as <u>waste/by-product/lost</u> ; g. glucose formed/shown in an equation; h. glucose molecules combine to form starch for storage; i. light energy transformed to chemical;	<i>Both needed for marking point.</i>	5 max
c	a. autotrophs/producers convert carbon dioxide into carbohydrates/carbon compounds in photosynthesis; b. carbon dioxide diffuses/moves from the atmosphere /water into autotrophs/plants; c. carbon compounds are transferred through food chains/OWTTE; d. carbon dioxide produced by respiration diffuses out of organisms into water/atmosphere; e. decomposers release carbon dioxide during decay/putrefaction; f. methane is produced from organic matter <u>in anaerobic conditions</u> (by methanogens); g. some methane diffuses into the atmosphere/accumulates in the ground; h. methane is oxidized to carbon dioxide (and water) in the atmosphere; i. peat forms when organic matter is not fully decomposed because of acidic/anaerobic conditions in waterlogged soils; j. partially decomposed organic matter from past geological eras/fossils was converted into coal/oil/gas that accumulated in rocks; k. carbon dioxide is produced by the combustion of biomass/fossilized organic matter/fuels; l. hard parts of some animals/corals/molluscs are composed of calcium carbonate m. can become fossilized in limestone;	<p><i>As this is an “explain” question, simply drawing a labelled diagram is not enough for [7]. Diagram would need sufficient annotations to meet the command term.</i></p> <p><i>If carbon compounds are referred to instead of carbon dioxide, penalise once then ecf.</i></p>	7 max

Question		Answers	Notes	Total
6	a	<p>a. cell wall; b. plasma membrane; <i>Clearly shown as a separate line under the cell wall or the inner line</i> c. cytoplasm AND <u>70S</u> ribosomes; <i>Do not allow (small) circles</i> d. nucleoid/naked DNA; e. plasmid OR pili OR flagella/flagellum;</p>	<p><i>Structures correctly drawn and labelled.</i></p> <p><i>Award [2 max] if any exclusively eukaryotic structures are shown.</i></p> <p><i>Do not allow cilia as they are not found in prokaryotes.</i></p>	3 max
	b	<p>a. halves the chromosome number/produces haploid cells; b. at start of meiosis each chromosome consists of two sister chromatids attached by a centromere; c. prophase (I): pairing of homologous chromosomes; d. crossing over occurs; e. chromosomes condense by supercoiling; f. metaphase (I): pairs of homologous chromosomes/bivalents move to equator of spindle OR metaphase (I): orientation of pairs of homologous chromosomes (prior to separation) is random; g. anaphase (I): centromeres do not divide OR anaphase (I): spindle fiber pulls chromosome/whole centromere with two sister chromatids to opposite poles; h. telophase (I): arrival of centromere with sister chromatids at opposite poles;</p>	<p><i>Some of these can be awarded for correctly annotated diagrams.</i></p> <p><i>No credit for events in meiosis II.</i></p>	5 max

(continued...)

(Question 6 continued)

Question	Answers	Notes	Total
c	<p>a. cells of skin provide a physical barrier/produce fatty acids/lactic acid/lysozyme which stops entry of microbes OR mucous membranes produce mucus to trap pathogens OR stomach cells produce hydrochloric acid which kills microbes;</p> <p>b. platelets start the clotting process preventing access of pathogens;</p> <p>c. (two types of) white blood cells fight infections in the body;</p> <p>d. phagocytes ingest pathogens (by endocytosis/phagocytosis);</p> <p>e. gives non-specific immunity to diseases / ingest any type of pathogen;</p> <p>f. production of antibodies by lymphocytes/B cells;</p> <p>g. in response to particular pathogens/antigens;</p> <p>h. gives specific immunity;</p> <p>i. lymphocyte/B cell makes only one type of antibody;</p> <p>j. plasma cells produce large quantity of (one type of) antibody;</p> <p>k. some lymphocytes act/remain as memory cells;</p> <p>l. can quickly reproduce to form a clone of plasma cells if a pathogen carrying a specific antigen is re-encountered;</p> <p>m. results in faster defence against second exposure to specific antigen/pathogen/disease;</p>		7 max