Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2020

Biology

Standard level

Paper 2

10 pages

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.

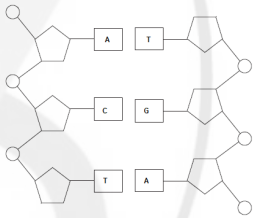
- **[1]** for quality is awarded when:
  - the candidate's answers are clear enough to be understood without re-reading.
  - the candidate has answered the question succinctly with little or no repetition or irrelevant material.

- 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;	*Allow numerical points if they are a valid comparison using distinguishing terms*.	**2 max**
	c		((165–150) ÷ 150) x 100; (=) 10 (%);	*Allow up to 167 = 11.3%* *1 mark for correct working if above 167.*	**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;	*Do not give credit for contrasts.*	**2 max**
	d	ii	<u>β cells</u> of pancreas/islets (of Langerhans);		**1**
	d	iii	as blood glucose rises, <u>insulin</u> <u>rises</u>/<u>increases</u> to reduce the level/*OWTTE*;	*Blood glucose must be mentioned as well as a rise in insulin.*	**1**
	e		*Hypothesis is partially supported* a.Increased saturated fats in study diet resulted in increase in cholesterol levels; b. cholesterol level is risk for blockage of coronary arteries; *Hypothesis is not supported* 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**

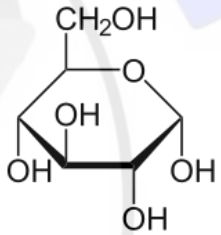
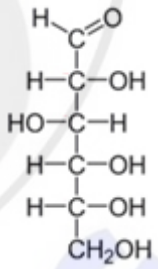
Question			Answer	Notes	Total
2	a	i	*Paramecium*		1
	a	ii	eukaryotes		1
	b		heterotroph/consumer as it feeds on bacteria/algae/yeast/smaller single celled organisms ***OR*** heterotroph/consumer as it does not have chloroplasts	*Heterotrophic must be qualified.*	1
	c		a. lives in fresh water so water enters cell (by osmosis); b. contractile vacuoles 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 prokaryotes/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;	*Both needed.* *Do not allow water loving/hating in mpa or mpc.*	**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</u>/<u>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;	 *Award **[2 max]** if bonds are not from the correct carbon or if the nucleotides are not joined.*	**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		a. hexagonal ring structure with O at one point (between C1 and C5); b. correct orientation of OH groups (on carbons 1 to 4); *Hydrogens not required* c. CH_2OH group shown on fifth carbon with correct orientation; ***OR*** d. 6 carbon chain with oxygen on first C; e. H and OH groups correctly orientated;	*Carbons do not need to be numbered.* *Allow boat or chair diagrams.*  ***OR***  *Allow **[2 max]** if linear structure drawn.*	**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 waste/by-product/lost; g. glucose formed/shown in an equation; h. glucose molecules combine to form starch for storage; i. light energy transformed to chemical;	*Both needed for marking point.*	**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 in anaerobic conditions (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; i. hard parts of some animals/corals/molluscs are composed of calcium carbonate m. can become fossilized in limestone;	*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.* *If carbon compounds are referred to instead of carbon dioxide, penalise once then ecf.*	**7 max**

Question			Answers	Notes	Total
6	a		a. cell wall; b. plasma membrane; *Clearly shown as a separate line under the cell wall or the inner line* c. cytoplasm ***AND*** 70S ribosomes; *Do not allow (small) circles* d. nucleoid/naked DNA; e. plasmid ***OR*** pili ***OR*** flagella/flagellum;	*Structures correctly drawn and labelled.* *Award **[2 max]** if any exclusively eukaryotic structures are shown.* *Do not allow cilia as they are not found in prokaryotes.*	**3 max**
	b		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;	*Some of these can be awarded for correctly annotated diagrams.* *No credit for events in meiosis II.*	**5 max**

(continued...)

(Question 6 continued)

Question			Answers	Notes	Total
	c		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; b. platelets start the clotting process preventing access of pathogens; c. (two types of) white blood cells fight infections in the body; d. phagocytes ingest pathogens (by endocytosis/phagocytosis); e. gives non-specific immunity to diseases / ingest any type of pathogen; f. production of antibodies by lymphocytes/B cells; g. in response to particular pathogens/antigens; h. gives specific immunity; i. lymphocyte/B cell makes only one type of antibody; j. plasma cells produce large quantity of (one type of) antibody; k. some lymphocytes act/remain as memory cells; l. can quickly reproduce to form a clone of plasma cells if a pathogen carrying a specific antigen is re-encountered; m. results in faster defence against second exposure to specific antigen/pathogen/disease;		**7 max**
