Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2024

Biology

Standard level

Paper 2

13 pages

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. Each row in the "Question" column relates to the smallest subpart of the question.

2. The maximum mark for each question subpart is indicated in the "Total" column.

3. Each marking point in the "Answers" column is shown by means of a semicolon (;) at the end of the marking point.

4. A question subpart may have more marking points than the total allows. This will be indicated by "**max**" written after the mark in the "Total" column. The related rubric, if necessary, will be outlined in the "Notes" column.

5. An alternative word is indicated in the "Answers" column by a slash (/). Either word can be accepted.

6. An alternative answer is indicated in the "Answers" column by "***OR***". Either answer can be accepted.

7. An alternative markscheme is indicated in the "Answers" column under heading ***ALTERNATIVE 1*** *etc*. Either alternative can be accepted.

8. Words inside brackets ( ) in the "Answers" column are not necessary to gain the mark.

9. Words that are underlined are essential for the mark.

10. The order of marking points does not have to be as in the "Answers" column, unless stated otherwise in the "Notes" column.

11. 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 "Answers" column 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) in the "Notes" column.

12. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

13. 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.

14. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the "Notes" column.

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**		solutions/maltose without added seaweed extract;		**1**
1.	**b**		*P. palmata* and *S. latissima;*	*Both required.*	**1**
1.	**c**		little inhibition when extracted in ethanol / *A. esculenta* is not soluble in ethanol / ethanol may affect/decompose *A.esculenta*;		**1**
1.	**d**		a. increased concentrations increases inhibition in all; b. *A. nodosum* in water extract inhibition reduces above 6.5-7.5mg cm^{-3} ***OR*** *A. nodosum* in water extract less effect above 6.5mg cm^{-3}; c. *F. vesiculosus* has large inhibitory effect ***OR*** *A. esculenta* has a small effect; d. *F. vesiculosus* in water plateau above 6.5mg cm^{-3} ***OR*** *F. vesiculosus* in ethanol plateau above 2.5 - 3 mg cm^{-3} ***OR*** *A. nodosum* in water plateau above 6.5mg cm^{-3}/at higher concentrations ***OR*** *A. nodosum* in ethanol does not plateau/rises continuously;	*OWTTE for mp a.* *To award mp b, mp c and mp d a specific species must be named.*	**2 max**
1.	**e**		7.8g;	*Unit required.*	**1**

(continued…)

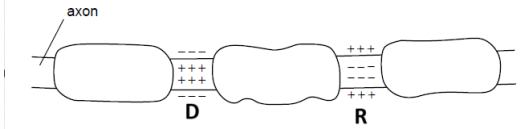
(Question 1 continued)

Question			Answers	Notes	Total
1.	**f**		a. *S.latissima* treatment gained less mass; b. *P.palmata* treatment gains mass consistently, *S.latissima* treatment only gains mass after week 5;	*Or converse.*	**2**
1.	**g**		a. all seaweed treatments have less HbA1c (than the control); ***OR*** *A. esculenta and P. palmata have the same % reduction in HbA1c* ***OR*** all treatments show low variability; b. *A.esculenta* /*P. palmata* have levels of HbA1c higher than *S. latissima* ***OR*** the *S. latissima* has the lowest HbA1c;		**2**
1.	**h**		***Benefit 2 marks max:*** a. (significantly) lowers mass gain so less increase in obesity; b. lowers HbA1c so blood glucose levels raised less of the time; c. these factors may decrease progression of diabetes***;*** ***No benefit 2 marks max:*** d. does not inhibit alpha-glucosidase; e. so absorption of glucose in the intestine is not slowed; f. study was not performed in humans, so results would be different / seaweed extract may have health consequences in humans ***OR*** other factors such as level of activity affect the data;		**3 max**

Question			Answers	Notes	Total
2.	**a**		a. (water loss from cell) causes cells shrinkage / membrane to be pulled inwards / crenated ***OR*** water has moved (by osmosis) out of the cells; b. (red blood cells) placed in a more concentrated salt (hypertonic) solution in B ***OR*** A has a lower solute concentration / higher water potential than B;	*For mp b accept the converse*.	**2**
2.	**b**		(water taken in until) the cells burst/lyse / hemolysis occurs;		**1**

Question			Answers	Notes	Total
3.	**a**		secondary consumer;		**1**
3.	**b**		a. 4 bars with largest bar at bottom; b. largest bar labelled A and D is smallest;		**2**
3.	**c**		Any 2 from dead organisms; faeces; excreta/urine;	*Need two to get 1 mark.*	**1 max**
3.	**d**		a. used for growth; b. metabolism/respiration/movement; c. lost as heat; d. lost as faeces/urine/not all parts consumed;		**2 max**

Question			Answers	Notes	Total
4.	**a**		line to artery;		**1**
4.	**b**		a. thick wall/muscle of artery versus thin wall/muscle of vein; b. (much) more elastic tissue in artery than in vein; c. small lumen of artery vs large lumen in vein; d. veins have valves, arteries do not;	*Accept statements of the converse*.	**2 max**
4.	**c**		much smaller/microscopic ***OR*** walls are one cell thick ***OR*** magnification of micrograph not high enough;		**1**

Question			Answers	Notes	Total
5.	**a**		X: dendrite; Y: myelin sheath/Schwann cell; Z: nucleus;		**3**
5.	**b**		first +/- section labelled D; second labelled R;		**2**
5.	**c**		depolarisation = top of the curve/ascending part of graph;		**1**
5.	**d**		a. gaps in myelin sheath (called nodes of Ranvier); b. depolarization jumps from gap to gap/node to node; c. speeds up the nerve transmission ***OR*** allows nerve impulse to move rapidly over long distances;		**2 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**		a. substitution occurs in one base of a DNA triplet **OR** GAG is replaced by GTG; b. mRNA is transcribed with the incorrect triplet/codon; c. CAC instead of CUC; d. a different amino acid is translated/ glutamic acid is replaced by valine; e. altering a peptide/amino acid sequence in hemoglobin; f. changes the shape of red blood cells / blood cells adopt a sickle shape ***OR*** red cells carry less oxygen;		**4 max**

(continued…)

(Question 6 continued)

Question			Answers	Notes	Total
6.	**b**		a. identification of alleles, H = normal, h = sickle cell; b. identification of gametes/alleles in Punnett grid; c. genotypes of offspring in grid; d. ¼ / 0.25 / 25% chance of sickle cell anemia ***OR*** identification of the sickle cell genotype;	*Accept other allele representation if it is autosomal and defined the allele symbol as dominant or recessive for mp a.*	**4 max**
6.	**c**		a. individuals with sickle cell trait are heterozygous / may carry (only) one copy of the recessive/mutated/ sickle cell allele; b. in malaria regions this is advantageous; c. individuals with sickle cell trait less likely to die from malaria ***OR*** individuals with one copy of the sickle cell allele less likely to die from malaria d. more survive to reproduce; e. pass on the sickle cell allele/gene; f. the allele increases/stays in the population; g. individuals homozygous for sickle cell survive less (due to anemia); h. individuals homozygous for normal hemoglobin more likely to contract malaria (less likely to survive); i. process is natural selection; j. no advantage for heterozygotes in non-malarial regions;		**7 max**

Question			Answers	Notes	Total
7.	a		a. cohesion is binding of water molecules to each other (e.g. surface tension); b. adhesion is binding of water molecules to surfaces (e.g. transport in xylem); c. water is a good coolant because of a high melting and boiling point /high heat of vaporization; d. more stable temperature because of high specific heat capacity; e. solvent for polar molecules/universal solvent allowing transport of substances in organisms/transport tissues / allows chemical reactions to occur; f. is transparent allowing light to reach plants / photosynthesis in water;	*Property needs to be linked to importance in a living system.*	**4 max**
7.	b		a. simple diffusion allows some molecules to cross the membrane down the concentration gradient; b. facilitated diffusion moves molecules down a concentration gradient ***OR*** through protein channels/carriers; c. active transport moves molecules against a concentration gradient ***OR*** through protein pumps; d. endo or exocytosis uses vesicles that fuse with the membrane; e. simple/facilitated diffusion do not require energy/ATP; ***OR*** active transport/endo and exocytosis require energy/ATP;		**4 max**

(continued…)

(Question 7 continued)

7.	**c**		a. increase caused (mostly) by human activities/anthropogenic; b. carbon dioxide increasing in atmosphere due to fossil fuel combustion/deforestation/ other verifiable human factors/actions; c. carbon dioxide in the atmosphere absorbs reflected infrared/long wave rays from the earth / enhanced greenhouse effect; d. raises global temperatures / global warming; e. oceans absorb heat / ocean temperature increases; f. sea levels rise / polar ice melts reducing habitat / warming causes coral bleaching; g. changes in ocean currents / changes in climate/weather patterns; h. carbon dioxide dissolves in oceans / diffuses from atmosphere/air into oceans; i. (dissolved) carbon dioxide is a (weak) acid / pH of ocean decreases / acidity increases; j. carbonate ions in water decrease / (calcium) carbonate becomes less available; k. corals/shellfish cannot build skeletons; l. other species become invasive / biodiversity/ecosystems/populations (of fish/algae) may be reduced/increased/changed / food chains/webs may be altered / species could die/become extinct/be displaced from their habitat / habitats of species are changed / other verifiable effects on marine organisms;		**7 max**