Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2022

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.

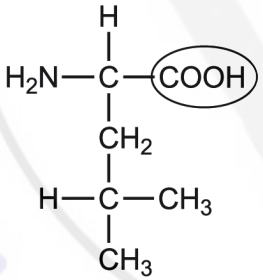
- Candidates that score very highly on the content marks need not necessarily automatically gain **[1]** for quality (and *vice versa*).

Section A

Question			Answers	Notes	Total
1.	a		2.5 %;	*% required*	1
	b		a. both show a decline in number; b. the mean decline for Hymenoptera is less than the mean for Lepidoptera ***OR*** there is a wider range of decline among the species of Lepidoptera;		2 max
	c		392000 (species);		1
	d		5;		1
	e		a. in both a greater mass of sucrose was eaten (than of the P:L mixture) ***OR*** the total mass eaten by both groups is the same/very similar; b. the mass of sucrose eaten in the 1:10 mixture diet is greater than in the 1:1 diet ***OR*** the mass of the P:L mixture eaten in the 1:10 is less than in the 1:1;	*Accept vice versa for all answers*	2
	f		0.025g;	*Unit needed*	1
	g		a. the mixture was closer to what the bees ate naturally; b. the bees like the taste better/prefer sucrose; c. there was more lipid in the 25:1 mixture so they achieved their daily lipid/energy requirement with less mass of food; d. the bees eating 50:1 diet ate more to reach their daily lipid requirement; e. prefer the higher proportion of protein (in the 50:1)		1 max
	h		the higher the lipid content, the fewer bees survived/negative correlation;		1

Question			Answers	Notes	Total
1.	**i**		10:1 diet as this has the highest survival rate (after 7 days);	*Reason must be given*	**1**
	j		a. habitat destruction removes the plants/flowers/natural food source of the bees; b. bees have to look for other food sources; c. many of these alternative sources of food are not suitable for bee survival ***OR*** pollen with a different proportion of protein to lipid would reduce survival; d. no control where bees are fed their normal diet is included; e. simulation is not using natural pollen / habitat; ***OR*** sample size is too small to make conclusions;	*Accept other reasonable discussion using the data*	**2 max**

Question			Answers	Notes	Total
2.	a		a. line to circle labelled phosphate (head) and (tail) labelled fatty acid/hydrocarbon/lipid (tail); b. label hydrophilic/polar/attracted to water/ and hydrophobic/non polar/not attracted to water;		2
	b		reduces fluidity of membrane / reduces permeability of membrane (to some molecules);	*Accept 'controls' or 'maintains ' as a BOD*	1
	c		a. mitochondria/chloroplasts have their own DNA; b. mitochondria can self-replicate/undergo a process like binary fission; c. mitochondria/chloroplasts have double membranes; d. mitochondria/chloroplasts have(70s) ribosomes; e. mitochondria/chloroplasts are sensitive to antibiotics; f. similar in size to bacteria		2 max

Question			Answers	Notes	Total
3.	a			*No mark if C1 in chain is included*	1
	b		insulin/glucagon/ADH/oxytocin/leptin / other verified example;		1
	c		a. the enzyme lactase acts on lactose; b. the enzymes are immobilised / are bound to alginate beads; c. (pouring milk over the immobilised enzymes) causes lactose to be hydrolysed/broken down into monosaccharides/glucose and galactose;	*Some product must be stated in mpc*	2 max

Question			Answers	Notes	Total
4.	a		◐		1
	b		50%/ 0.5/ 1/2;		1
	c		a. if it was sex-linked it would be on the x chromosome; b. there cannot be a heterozygous male if the trait is sex-linked c. males would pass the allele to their daughter; d. daughter is not shown as heterozygous so it is not sex linked;		2 max
	d		a. sequence of DNA bases determines the amino acid sequence of a protein; b. changing one base (on the DNA) can cause the triplet /mRNA to code for a different amino acid; c. changing one base (on the DNA) causes a different protein to be made (during translation);		2 max

Question			Answers	Notes	Total
5.	**a**		(Neurotransmitter) vesicle;	*Do not accept Vacuole*	**1**
	b		a. the arrival of a nerve impulse/action potential/depolarisation (stimulates the release of a neurotransmitter); b. depolarisation stimulates calcium ion channels to open; ***OR*** calcium ions enter the presynaptic knob/button c. (calcium ions) cause the vesicle to fuse with / move to the membrane ***OR*** vesicles release neurotransmitter by <u>exocytosis</u>;		**2 max**
	c		a. prevents synaptic/nerve transmission b. is /acts like /has similar structure to a neurotransmitter/acetylcholine c. (neonicotinoid pesticides) bind to acetylcholine receptors in the post synaptic membrane; d. neonicotinoid pesticides are not broken down (as acetylcholine would be) by acetylcholinesterase/enzyme; e. the receptors are overstimulated f. paralyses/kills the insects;		**3 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. energy from the sun is captured by plants/autotrophs; b. light energy is converted to chemical energy by photosynthesis; c. energy is passed to animals/consumers/along the food chain; d. at each stage in the food chain energy is lost by respiration/as heat; e. much less energy/only about 10% is available at each stage/trophic level of the food chain; f. some energy is made available to decomposers when organisms die/parts fall to the ground; g. energy cannot be recycled		**4 max**
	b		a. plants reduce the amount of carbon dioxide in the atmosphere by photosynthesis; b. carbon dioxide is fixed/converted into organic substances/sugars/ OWTTE; c. plants respire which releases carbon dioxide into the atmosphere; d. plant decomposition may release CO_2 e. carbon in dead plants is trapped/ stored in fossil fuels / peat f. combustion of plants/wood/ fossil fuels adds to the amount of carbon dioxide in the atmosphere;	***OR** Shows correct equation*	**4 max**

Question			Answers	Notes	Total
6.	**c**		*Naming:* a. binomial nomenclature / (plant is) given a binomial/double name; b. first name is the genus and second name is the species / genus initial upper case and species lower case; c. names (of plant species) are international/are universally understood/are published in journals; *Classification:* d. study the characteristics/structure/reproduction/chemical properties/DNA (of the plant); e. put/classify (the plant) in a group/genus with other similar species; f. natural classification corresponds with evolution / natural classification is based on many features g. analogous features/features due to convergent evolution should not be used; h. hierarchy of groups/taxa (in traditional classification / 3 or more taxa in correct sequence (kingdom-phylum-class); i. two or more of bryophyta, filicinophyta, coniferophyta and angiospermophyta named; j. a clade is a group of organisms evolved from a common ancestor; k. base sequences/amino acid sequences used to group organisms into clades/deduce evolutionary relationships; l. cladograms show the relationships between clades/likely evolutionary divergence of clades; m. each branch point/node represents where species are formed via divergent evolution; n. species are now classified into a sequence of clades (rather than a rigid hierarchy of taxa);	*Mpi accept common names, mosses, ferns etc*	**7 max**

Question			Answers	Notes	Total
7.	a		a. starch is broken down by the enzyme amylase; b. (amylase) secreted by the pancreas/salivary glands; c. acts in the duodenum/small intestine/mouth; d. starch is broken down into monomers/maltose/glucose; e. products of digestion are smaller/more soluble molecules for absorption		**3 max**
	b		a. small intestine is very long; b. small intestine contains villi/microvilli; c. the epithelial cells of villi have microvilli d. these increase the surface area for absorption; e. the cells of the small intestine contain (a large number of) mitochondria; f. these provide energy for active transport; g. the walls contain proteins for active transport/ facilitated diffusion h. the villi have a rich blood supply/ lacteals; i. the walls of the villi are thin so less distance for diffusion;		**5 max**

Question			Answers	Notes	Total
7.	c		a. the contraction of the heart is myogenic / heart beat initiates within the heart tissue itself; b. heart beat initiates in the sinoatrial node ***OR*** SA acts as a pacemaker; c. the SA node is located in the right atrium; d. electrical impulses pass over the atria then the ventricles; e. nerves from the medulla can control the rate of heart beat/ blood flow; f. epinephrine/adrenaline can increase the rate of the heart/blood flow; g. contraction of heart/cardiac muscle causes blood to flow; h. ventricles send blood to the organs/cells of the body i. the direction of flow is controlled by valves/valves prevent backflow ***OR*** when the heart/named chamber contracts the valves/named valve open. j. AV valves prevent backflow from ventricles/into atria k. semilunar valves prevent blood returning/backflow to the heart/ventricles		**7 max**