Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2023

Biology

Standard level

Paper 2

14 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 <u>underlined</u> 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.

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.

Section A

Question			Answers	Notes	Total
1.	**a**		QFED is 660;	*Allow 650 to 680 Tg*	**1**
	b		a. larger than annual (CO_2) emissions for the whole of Australia; b. larger than all fossil fuel emissions for the whole of Australia in a typical year; c. extreme/intense/ ***OWTTE***; d. (much) larger than the typical emissions of 9 Tg (for Nov) to Jan in SE Australia;		**3 max**
	c		a. higher AOD during the wildfire period than before; b. more fluctuation/more spikes in AOD during the wildfire period than before;	*Accept converse for both.*	**2**
	d		a. rises/increases in phytoplankton/chlorophyll in Nov to Jan 2019-20 whereas it falls/decreases in previous years; b. higher in Nov to Jan 2019-20 than previous years; c. large fluctuations in 2019-20 versus /smoother/less variation/steadier in previous years d. a correct mathematical discussion of the magnitude;	*Both parts required in mpa*	**3 max**
	e		a. levoglucosan/ iron concentrations increase from Nov 27, 2019 to Jan 17, 2020; b. (because)both are released during combustion/burning; c. wildfires released large/significant amounts/concentrations of iron because it is a component of smoke; d. levels of levoglucosan and iron differ after Jan 17 because iron remains in the atmosphere longer than the levoglucosan		**2 max**

Question			Answers	Notes	Total
1	f		a. conditions/observations in the hypothesis; b. reasoning in the hypothesis; *Examples:* • iron from wildfires was deposited in the oceans; • which increases phytoplankton growth; ***OR*** • deposition of iron caused growth/bloom; • iron being a limiting factor for growth of phytoplankton; ***OR*** • increased level of iron in water allows increased production of chlorophyll; • so, phytoplankton growth is high;	*Accept other reasonable hypotheses that respond to the question.*	**2**

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Notes</th><th>Total</th></tr>
<tr><td>2.</td><td>a</td><td></td><td>
<table>
<tr><td></td><td>gland</td><td>Hormone</td><td>Hormone and role in the menstrual cycle</td></tr>
<tr><td>a.</td><td>pituitary</td><td>FSH

OR
LH</td><td>FSH stimulates development of follicles/ egg maturation/ estrogen secretion
OR
LH triggers ovulation/ development of corpus luteum;</td></tr>
<tr><td>b.</td><td>ovaries</td><td>estrogen

OR
progesterone</td><td>estrogen stimulates growth/ repair of endometrium/ uterus lining/ inhibits FSH secretion/stimulates LH secretion/inhibits FSH
OR
progesterone maintains/thickens uterus lining/ endometrium (for implantation);</td></tr>
</table>
</td><td></td><td>2</td></tr>
<tr><td></td><td>b</td><td></td><td>a. thin/ one-cell thick walls (shorten the distance for diffusion);
b. gaps/ fenestrations/porous walls (allow faster diffusion/increase permeability);
c. small diameter/narrow (allows capillaries to be close to most cells);</td><td>descriptions of membranes are rejected</td><td>2 max</td></tr>
</table>

Question			Answers	Notes	Total
3.	**a**		DNA/deoxyribonucleic acid;	*Do not accept nucleic acid or RNA*	**1**
	b		a. identical/the same; b. (because of) asexual reproduction/vegetative propagation/mitosis/DNA replication; c. clones/produced by cloning d. any differences would be due to mutation		**2 max**
	c		a. nucleus removed from egg cell/ovum ***OR*** unfertilized egg taken from sheep/animal and nucleus removed; b. body/somatic cells removed from donor/another animal/sheep; c. enucleated egg and body cell/donor cell fused ***OR*** egg cell nucleus replaced by somatic/body cell nucleus; d. (resulting) embryo/cell implanted in surrogate/mother/another individual;		**3 max**

Question			Answers	Notes	Total
4.	**a**		I = nucleus; II = Golgi (apparatus/body); III = mitochondrion;		**3**
	b		a. eukaryotic because cytoplasm is compartmentalized / there are membrane-bound organelles; b. eukaryotic because a nucleus is present; c. eukaryotic because a mitochondrion is present/other named eukaryotic cytoplasmic organelle that can be seen in micrograph; d. eukaryotic, as scale shows that it is far bigger than a prokaryotic cell;	*'organelles' on its own is insufficient.*	**2 max**
	c		flagella = movement/locomotion; ribosome = protein synthesis/translation;		**2**

Question			Answers	Notes	Total
5.	**a**		a. (presence of) beak; b. (skin covered with) feathers; c. wings; d. lungs with air sacs; e. (females lay) eggs with a <u>hard</u> shell; f. hollow bones;	*Do not accept "no teeth".*	**2 max**
	b		*Similarity:* a. pairs of chromosomes/ homologous chromosomes; *Difference:* b. saffron finch has more chromosomes ***OR*** saffron finch has two different sex chromosomes in female unlike human female (which has two homologous/same chromosomes);		**2**

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

Question			Answers	Notes	Total
6.	**a**		a. photosynthesis uses CO_2/carbon from the atmosphere; b. (photosynthesis) produces glucose/carbon compounds; c. fatty acids/oils/lipids are derived from glucose/carbon compounds; d. (oils are) three fatty acids linked to one glycerol; e. by condensation reactions; f. carboxyl/COOH group of fatty acid linked to hydroxyl/OH group of glycerol; g. oils are made up of <u>un</u>saturated fatty acids;	*Chemical equation may be used to gain mpa and mpb.* *Structure of triglyceride could be taken from a diagram*	**4 max**
	b		a. sugar/glucose is hydrophilic; b. oils are hydrophobic; c. sugar molecules are polar **whereas** oil molecules/hydrocarbon chains are non-polar; d. oil does not form hydrogen bonds with water **whereas** sugar/glucose does; e. oil molecules are more attracted to each other than to water; f. water is polar and polar substances are attracted to each other;	*Both parts of mpc and mpd are required for the mark*	**4 max**

Question			Answers	Notes	Total
	c		a. fat-rich diets contain saturated/trans fats/ cholesterol; b. (excess saturated/ trans fat/ cholesterol) can be deposited in walls of arteries; c. forming atheroma / atherosclerosis / plaque; d. a thrombus/ blood clot/ thrombosis may be formed due to rough surface of atheroma/ plaque; e. (atheroma/ thrombus/blood clot/ thrombosis) cause occlusion of arteries; f. restricted supply of oxygen/glucose/not enough ATP/ energy to tissues; g. if blood flow to coronary arteries is reduced, heart muscle lacks oxygen/weakens/heart attack; ***OWTTE*** h. atherosclerosis/ atheroma/plaque causes hardening of arteries/loss of elasticity; i. which causes hypertension/high blood pressure; j. can lead to obesity; k. increases risk of type II diabetes/strokes/cancer/knee or hip injuries/inhibits exercise/other verifiable risk; l. fat-rich diets may lead to malnutrition/person not getting required nutrients;		**7 max**

Question			Answers	Notes	Total
7.	**a**		a. increased concentrations of carbon dioxide in solution produce carbonic acid/H^+/hydrogen ions; ***OR*** pH of water becomes more acidic/ ocean acidification occurs; b. other organisms/fish/ algae/ aquatic plant populations might be reduced/ harmed; c. concentration of carbonate ions in water is reduced; d. corals destroyed/ harmed as they cannot make their exoskeletons ***OR*** coral bleaching ***OR*** mollusc populations reduced/ harmed as their shells fail to form; e. (initially) faster autotroph/algae growth due to more photosynthesis/ more dissolved carbon dioxide; f. destruction of coral causes habitat changes for other organisms in community leading to loss of biodiversity;		**4 max**

Question			Answers	Notes	Total
7	b		a. variation exists within a population; b. sexual reproduction/mutation leads to variation within a population; c. more individuals are born than the environment can support, competition for resources occurs; d. when environmental conditions change/example of a change, increased competition occurs/struggle for survival increases; e. better adapted individuals have higher chance of survival/or converse; f. traits to avoid predation/resistance to pests/ resistance to antibiotics/ improved feeding opportunities/ immunity to diseases may be favourable variations; g. better adapted /surviving individuals have more chance of breeding/producing offspring; h. heritable traits/characteristics are passed on to offspring; i. when populations adapt to environmental conditions, the favourable allele/trait increases in the population /***OWTTE***;	*Accept marking points when they are made with correct use of an example. E.g. Darwin's finches*	**7 max**
	c		a. emphysema results in fewer alveoli which are larger; b. (fewer, larger alveoli) means less surface area for gas exchange; c. entry of oxygen into blood and release of carbon dioxide from blood is reduced/inefficient; d. alveolar walls lose elasticity/more difficult to inflate (stretch and) recoil; e. alveolar spaces become larger which increase diffusion distance; f. ventilation is more difficult/ lungs are not well ventilated; g. because more elastase/ protease produced by phagocytes destroys alveolar walls/ reduces elasticity;		**4 max**