8823 – 6017M

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2023

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 <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
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
1.	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
1.	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

(continued …)

(Question 1 continued)

Question			Answers	Notes	Total
1.	**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**
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**

Question			Answers	*Notes*	Total
2.	**a**		a. Testosterone: stimulates development of male genitalia/sperm production/male sex drive/male secondary sexual characteristics / examples of male secondary sexual characteristics; b. Epinephrine: increases the heart rate/or any other specific effect on the body;		**2**
2.	**b**		a. there is a double circulation/pulmonary circuit AND systemic circuit; b. blood from glands moves first to the (right side) of the heart; c. (from the heart) then they are pumped to lungs and back to the (left side) of the heart (so blood can be oxygenated); d. then pumped again to reach target tissue;		**2 max**
3.	**a**		DNA/deoxyribonucleic acid;	*Do not accept nucleic acid or RNA*	**1**
3.	**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**
3.	**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**
4.	**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**
4.	**c**		Flagella = movement/locomotion; Ribosome = protein synthesis/translation;		**2**

Question			Answers	Notes	Total
5.	**a**		a. hair/fur; b. mammary glands/secretion of milk; c. placenta/live young born/vivipary; d. different types of teeth/incisors, canines and molars; e. external pinnae/ears; f. other verified mammalian feature related to orangutan;		**2 max**
5.	**b**		48 chromosomes in total instead of 46/an extra pair of chromosomes;	*Accept 23/22 pairs of autosomes;*	**1**
5.	**c**		females because there are two X chromosomes ***OR*** absence of Y chromosome;		**1**

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. photosynthesis uses CO_2/carbon from the atmosphere; b. (photosynthesis) produces glucose/carbon compounds; c. fatty acids/oils/lipids produced 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**
6.	**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 / vice versa; 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**

(continued…)

(Question 6 continued)

Question			Answers	Notes	Total
6.	**c**		a. blood glucose levels monitored by (cells of) pancreas ***OR*** insulin AND glucagon secreted by pancreas*;* b. glucagon secreted by α/alpha cells (in the pancreas/islets); c. (glucagon secreted) when blood glucose levels are low; d. insulin secreted by β/beta cells (in the pancreas/islets); e. (insulin secreted) when blood glucose levels are high; f. glucagon increases blood glucose concentration; g. glycogen converted to glucose in liver/muscle; h. insulin decreases blood glucose concentration; i. insulin causes glucose uptake by cells/muscle/liver; j. insulin stimulates use of glucose (for cell respiration); k. insulin causes conversion of glucose to glycogen; l. hunger with low blood glucose concentration ***OR*** food intake increases blood glucose concentration; m. blood glucose level controlled by negative feedback mechanisms;		**7 max**

Question			Answers	Notes	Total
7.	**a**		a. oxygen concentration was increased by photosynthesis; b. in photosynthetic bacteria/billions of years ago/***OWTTE***; c. carbon dioxide concentration increases due to aerobic respiration; d. methane emitted by methanogens/ruminants (cows); e. (methane produced) in anaerobic conditions/swamps; f. reference to calcareous removal of CO_2 from atmosphere; g. humans (since the industrial revolution/over the past 200 years/in the recent past) increase carbon dioxide concentration due to burning coal/oil/gas/fossil fuels ***OR*** Human deforestation (indirectly) causes an increase of CO_2/decrease of O_2 ***/OWTTE***; ***OR*** increase of cattle husbandry/crops increase methane release ***OR*** human release of sulphurous and nitrogen oxides from industrial activities (causing acid rain);	*Reference to limestone/ coral* in f.	**4 max**

(continued…)

(Question 7 continued)

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, competition for resources 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 onto 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**
7.	**c**		a. muscle contractions cause volume changes; b. (as a result) the pressure changes; c. volume of lungs/thoracic cavity increased to cause pressure reduction/vice versa; d. (contraction of) external intercostal muscles reduce pressure; e. diaphragm(contraction) reduces pressure; f. contraction of abdomen wall/internal intercostal muscles increases pressure;		**4 max**