Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2024

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. A markscheme often has more marking points than the total allows. This is intentional.

2. Each marking point has a separate line and the end is shown by means of a semicolon (;).

3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.

4. An alternative answer is indicated by "***OR***". Either answer can be accepted.

5. An alternative markscheme is indicated under heading ***ALTERNATIVE 1*** etc. Either alternative can be accepted.

6. Words in brackets ( ) in the markscheme are not necessary to gain the mark.

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

8. The order of marking points does not have to be as in the markscheme, unless stated otherwise.

9. 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 markscheme 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).

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

11. 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.

12. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

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		soil and dust;		1
1.	b		11 %;	*11–12 % acceptable range.* *Units required.*	1
1.	c		a. they stopped crawling/playing on the ground therefore (slightly) less lead intake from soil and dust; b. (after 6 months) children (more active and growing) eat more food; c. (after 6 months) most children's diets change from breastmilk/formula to food, so less lead intake from water;		1 max
1.	d		150 μg L^{-1} /μg/L;	*Units required.*	1
1.	e		a. (similarity) in US and China the mean BLL of the children decreased; b. (difference) decrease after US ban is greater than decrease after China ban ***OR*** US declines more than 100 μg/L /drastic change while China declines only about 50 μg/L /gradual change ***OR*** US steady decrease and China slight fluctuation at 2011/slight rise in 2015 ***OR*** US level lower than China level;		2

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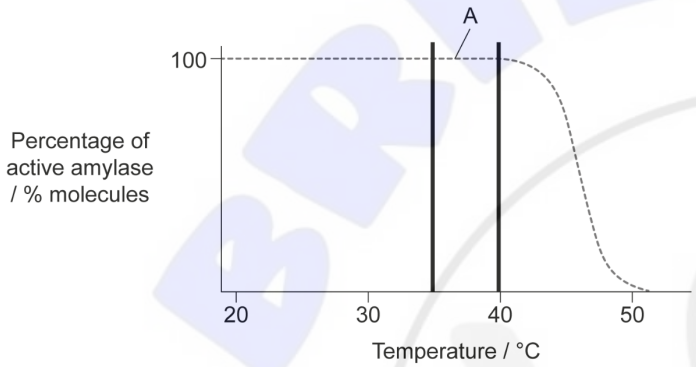
Question 1 continued

Question			Answers	Notes	Total
1.	**f**		a. no treatment (for most children) was required in the US as the mean BLL of children was (always) below 35 μg L^{-1}; b. treatment (for most children) recommended in China in all years since 2000 as (always) above 35 μg L^{-1};		**2**
1.	**g**		mining;		**1**
1.	**h**		BLL (in heavy traffic sites) would be higher because lead gasoline ban had not been introduced/was only introduced in 2000;		**1**
1.	**i**		a. e-waste has a (potential) negative impact / potentially causes an increase in the BLL of children; b. (the first graph/chart shows) children are affected by lead from different pathways and lead from e-waste could enter these pathways; c. (the third graph/chart shows) children living near e-waste dumping sites have a higher BLL than all sites except mining (in 2007 to 2017); d. (first appearance of e-waste dumping data appears in 2007-2017 so) more technology/E-waste will likely increase that value; e. correlation of E-waste dumping to higher BLL does not mean causation;		**3 max**

Question			Answers	Notes	Total
2	**a**	**i**	G1, S, G2;		**1**
2.	**a**	**ii**	G2 doubles G1;		**1**
2.	**b**		a. phospholipids are amphipathic/have hydrophobic/nonpolar and hydrophilic/polar regions; b. <u>phosphate heads</u> are hydrophilic/polar and <u>fatty acid/hydrocarbon tails</u> are hydrophobic/nonpolar; c. hydrophilic/polar (phosphate) heads face/are attracted to water (inside and outside of cell); d. hydrophobic/nonpolar (fatty acid) tails face each other inwardly/away from water/ not attracted to water;	*Accept each marking point in a labelled diagram*.	**3 max**

Question			Answers	Notes	Total
3.	a	i		*Accept any value from 35 to 40°C.*	**1**
3.	a	ii	enzyme denatured (shape of active site is changed);		**1**
3.	b		a. villi/microvilli in the small intestine increase the surface area for absorption; b. (the villi) walls are one cell thick for faster diffusion over short distance; c. the intestine is long allowing more time for digested products to pass through/be absorbed; d. rich supply of blood vessels (capillaries in villi) to remove absorbed monosaccharides/glucose; e. specific channels allow passage of glucose;		**2 max**

Question			Answers	Notes	Total
4.	**a**		anaphase / anaphase I;	*Do not accept anaphase II.*	**1**
4.	**b**		a. haploid cells contain half the number of chromosomes; b. at fertilization/male and female gametes combine; c. diploid number is restored/maintain chromosome number; d. increases genetic diversity;		**2 max**
4.	**c**		a. non-disjunction occurs when chromosomes fail to separate (during meiosis); b. this leads to a gamete with an extra chromosome; c. if fertilization occurs with this gamete the zygote will have an extra chromosome; d. Down syndrome is when an individual has trisomy 21/an extra chromosome 21;		**3 max**

Question			Answers	Notes	Total
5.	**a**		a. X as it has muscular/thicker walls; b. X as it has a smaller lumen (than Y);		**1 max**
5.	**b**		a. nerves impulses from the brain (medulla) can increase the heart rate; b. epinephrine/adrenaline (increases the heart rate);		**2**
5.	**c**		a. platelets release clotting factors/start cascade; b. (clotting factors) activate thrombin; c. (thrombin) causes the conversion of fibrinogen to fibrin; d. this forms a seal/clot/scab which prevents the entrance of bacteria;		**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. lipids are stored in adipose tissue/fat cells; b. lipids take less space to store than carbohydrates; c. lipids primarily function as long-term energy reserve; d. lipids are difficult to transport; e. lipids have more (double the amount) energy than carbohydrate/protein per gram; f. lipids are broken down to release energy when other energy sources (such as carbohydrates and proteins) are used up;		**4 max**
6.	**b**		a. gas exchange takes place between the alveoli and capillaries; b. alveoli surrounded by (dense) network of blood capillaries; c. blood returning to alveolar capillaries is low in oxygen; d. ventilation brings air rich in oxygen into the alveoli/lungs; e. there is a higher concentration of oxygen in alveoli than in blood capillaries; f. oxygen diffuses from alveoli/lungs to capillaries (moves down a concentration gradient);	*e. Accept converse.*	**4 max**

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Question 6 continued

Question			Answers	Notes	Total
6.	**c**		a. plants/autotrophs use sunlight in photosynthesis; b. light energy is captured by chloroplasts/chlorophyll; c. converting light energy to chemical energy; d. this converts inorganic molecules into organic molecules; e. plants (other photosynthetic organisms) are producers; f. plants/producers are eaten by primary consumers/animals/heterotrophs; g. energy transfers through a food chain/web/trophic levels; h. at each stage of the food chain/web/trophic levels energy is lost (as heat/respiration); i. about 10 % of the energy reaches the next trophic level; j. energy flow being linear/one-direction/not cyclic;	*d. Accept word equation or chemical equation for photosynthesis.* *f. Can be shown in a labelled drawing.*	**7 max**

Question			Answers	Notes	Total
7.	a		a. transcription is the synthesis of mRNA copied from the DNA base sequences (by RNA polymerase); b. translation is the synthesis of polypeptides on ribosomes; c. the amino acid sequence of polypeptides is determined by mRNA (according to the genetic code); d. codons of three bases on mRNA correspond to one amino acid in the polypeptide; e. translation depends on complementary base pairing between codons on mRNA and anticodons on tRNA;		**3 max**
7.	b		a. colour blindness is carried on the X chromosome/is a sex-linked gene/disease/condition/trait; b. red-green colour blindness is caused by a recessive allele ***OR*** is a recessive disease/trait/allele; c. males have only one X chromosome/XY; d. if males carry the recessive allele, they will have the condition; e. females have two X chromosomes/XX; f. to have the disorder they would need to have two recessive alleles for colour blindness; g. females with one recessive allele for the condition are known as carriers for the gene;	*Accept a well annotated Punnett square for marking points c,d,e and f.*	**5 max**

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Question 7 continued

Question			Answers	Notes	Total
7.	**c**		a. evolution/natural selection requires genetic variation; b. variation can arise from mutations in chromosomes; c. mutations form new alleles/changes in DNA; d. crossing over of chromosomes during meiosis causes variation; e. independent/random assortment during meiosis causes variation; f. random fertilization leads to variation; g. sexual reproduction leads to variation (in the population); h. this results in offspring with phenotypes different from their parents; i. variations/phenotypes may be favored by natural selection/selective advantage; j. these individuals are more likely to survive and reproduce/pass these traits on to their offspring; k. over time/generations the allele/gene/trait will appear more often in the population;	*Accept the converse for marking points i, j and k.*	**7 max**