8824-6005M

Markscheme

November 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. 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.

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**		a. initially as the number of sessions increased there was more cooperation; b. later / after around 20 sessions the level of cooperation remained/high/constant/ did not drop/positive correlation ***OR*** less variation after 25 sessions;		**2**
1.	**b**		the cooperation had reached zero/no cooperation;		**1**
1.	**c**		with two trays, both eat so they cooperate ***OR*** with one tray there is competition/fighting/monopoly;		**1**
1.	**d**		a. 25 % had a frequency of zero; b. some elephants showed no aggression;		**1 max**
1.	**e**		a. both monopoly and fighting increased (in the one-tray trials as compared to two-tray trials); b. monopoly increased more than fighting ***OR*** monopoly had a greater range/spread of frequencies with one plate of food;		**2**

Continued…

Question 1 continued

Question			Answers	Notes	Total
1.	**f**		a. competition is low with two trays as no/little opportunity to grab food from both trays ***OR*** when there is only one tray the elephants are more desperate to obtain the food for themselves; b. fighting occurs less often than monopoly as fighting is potentially harmful; c. monopoly shows wider range (than fighting) as more likely to attempt this type of competitive behaviour; d. one elephant could be larger than the other/one could be female while the other is male;		**1 max**
1.	**g**		0.40/40%;	*Allow range of 0.32 to 0.48.*	**1**
1.	**h**		*Similarities:* a. both have a period at the beginning when probability of fighting is high ***OR*** when the rank difference is high there is a very low chance of a fight occurring in both cases; *Differences:* b. when the elephant initiating a fight is of equal rank/0 there is less chance of a fight with 2 plates of food than with one ***OR*** the one tray probability stays constant until rank difference reaches a higher level than in two trays ***OR*** when the rank difference is higher, the fight chance decreases with two plates but stays high/constant with one plate;	Accept other specific differences or similarities.	**2**

Continued…

Question 1 continued

Question			Answers	Notes	Total
1.	**i**		a. when there is more food available the elephants are willing to share/cooperate ***OR*** when food is scarce, survival/competition is more beneficial than cooperation ***OR*** natural selection will favour the behaviour that gives elephants sufficient food; b. the elephants may not behave in the same way in the wild; ***OR*** controls are not specified/how much food was available was not given/gender of elephants/sizes/ages/whether or not the same elephants were used for the trials;		**2**

Question			Answers	Notes	Total
2.	**a**	**i**	palisade/mesophyll cell;		**1**
2.	**a**	**ii**	45 µm;	*Units required.* *Accept other correct units.*	**1**
2.	**b**		a. vascular tissue/xylem/phloem; b. flowers; c. seeds; d. fruits; e. stems/leaves;		**1 max**
2.	**c**		a. eukaryotic cells may have evolved from early prokaryotes/bacteria; b. one prokaryote was engulfed by another; c. the engulfed cell was beneficial/ was retained/not digested/helped the larger cell ***OR*** engulfed cells also benefitted ***OR*** symbiotic relationship occurred; d. over time, these (engulfed cells) became an organelle/chloroplast/mitochondria;		**3 max**

<table>
<tr><th colspan="3">Question</th><th>Answers</th><th>Notes</th><th>Total</th></tr>
<tr><td>3.</td><td>a</td><td></td><td>HH and/or Hh;</td><td>Both required.</td><td>1</td></tr>
<tr><td>3.</td><td>b</td><td></td><td><table><tr><td></td><td>H</td><td>h</td></tr><tr><td>h</td><td>Hh</td><td>hh</td></tr><tr><td>h</td><td>Hh</td><td>hh</td></tr></table></td><td>1 mark for correct parental genotypes/gametes (male parent is heterozygous dominant and female parent is homozygous recessive). However, labelling of male and female is not expected in the answer.
1 mark for correct genotypes of offspring.</td><td>2</td></tr>
<tr><td>3.</td><td>c</td><td></td><td>a. (endonucleases) cut DNA sequences at sequence-specific sites;
b. cuts out the target gene from bacterial DNA/plasmid;
c. leave overhangs / sticky ends /exposed DNA where genes can be attached (by ligase);</td><td></td><td>2 max</td></tr>
</table>

Question			Answers	Notes	Total
4.			a. heat in the atmosphere/ocean melts the ice; b. (combustion of fossil fuels) produces carbon dioxide / a greenhouse gas; c. excess/ more than normal CO_2 enhances greenhouse effect/increases trapped heat ***OR*** (excess CO_2) raises global temperature/global warming; d. (because) the Earth releases long wave radiation/heat into space; e. carbon dioxide absorbs long wave radiation/heat; f. carbon dioxide re-emits the long wave radiation/heat;		**3 max**

5.	**a**	**i**	0.5 (litres);		**1**
5.	**a**	**ii**	15 breaths per minute;	*Units are required.*	**1**
5.	**a**	**iii**	a. contraction of the diaphragm lowers the diaphragm; b. contraction of external intercostal muscles raises/lifts ribcage ***OR*** relaxation of internal intercostal muscles allows rib cage to rise/lift; c. increases the volume of the thorax lowering the pressure;		**3 max**
5.	**b**		a. deoxygenated blood leaves heart from the right side/right ventricle; b. blood travels through pulmonary valve/semi-lunar; c. (blood) travels through in the pulmonary artery to the lungs;	Accept a labelled diagram showing the flow of blood.	**2 max**

Section B

Clarity of communication*: *[1]

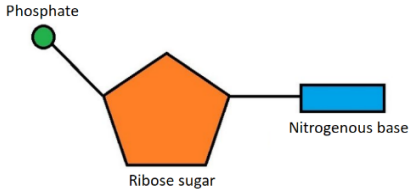
The candidate's answers are clear enough to be understood without re-reading. The candidate has answered the question succinctly with little or no repetition or irrelevant material.

Question			Answers	Notes	Total
6.	**a**		a. membrane structure is double layer of phospholipids / bilayer; b. phospholipids consist of a phosphate head and 2 fatty acid tails; c. the (phosphate) head is polar / hydrophilic; d. the (fatty acid) tails are non-polar / hydrophobic; e. tails repel water/ are attracted to each other so found towards the inside (of the bilayer); f. head forms H bonds/ interacts with water so face outwards (of the bilayer);	*Allow correct well labelled diagram showing marking points.*	**4 max**
6.	**b**		a. (in facilitated diffusion), molecules diffuse from areas of high to low concentration/down the concentration gradient; b. membrane interior is mostly hydrophobic; c. (facilitated diffusion) allows polar molecules to cross a membrane; d. with the assistance of channel/membrane proteins; e. transport/integral proteins span the width of the membrane; f. (this protein is) a hydrophilic channel that allows substances to diffuse through; g. energy/ATP is not used in this process/passive transport;		**4 max**

Continued…

Question 6 continued

Question			Answers	Notes	Total
6.	**c**		a. neurons transmit impulses through the movement of ions; b. sodium ions are found in greater concentrations outside of the cell than in; c. the inside of the neuron is relatively more negative than the outside; d. potassium ions are found in greater concentrations inside the cell than out; e. the difference in ion concentration is maintained by sodium-potassium pumps; f. nerve impulses are due to action potentials; g. the action potential occurs when sodium ions diffuse into the neuron and potassium ions out; h. depolarization occurs if the resting potential rises above the threshold potential; i. this causes an action potential/depolarization in the adjacent part of the membrane/neuron; j. the myelination of nerve fibres allows for saltatory conduction; k. repolarization restores the resting potential;	*Marking points may be gained when shown on a labelled diagram.*	**7 max**

Question			Answers	Notes	Total
7.	a		 a. <u>ribose</u> drawn as a pentagon **and** labelled; b. base linked correctly (to C_1) of ribose **and** labelled; c. <u>phosphate</u> linked correctly (to C4) of ribose **and** labelled;		**3**
7.	b		a. RNA allows the DNA/genetic code to be expressed as a polypeptide; b. (translation) involves both messenger RNA/mRNA and transfer RNA/tRNA; c. mRNA nucleotide sequence determines the amino acid sequence of the polypeptide; d. mRNA binds to a ribosome; e. (mRNA) has triplets of bases / 3 bases known as codons; f. each tRNA has a triplet of bases called an anticodon; g. specific amino acid attached to tRNA (depending on anticodon); h. tRNA binds to the mRNA/codon; i. (tRNA binds to mRNA) following rules of complementary base pairing; OWTTE j. tRNA adds its amino acid to the polypeptide chain;		**7 max**

Continued…

Question 7 continued

Question			Answers	Notes	Total
7.	**c**		a. bacteria have variation in their genes ***OR*** bacteria may have plasmids adding (genetic) variation to the bacteria; b. mutations are random changes in the nucleic acids/DNA/genes/plasmids (of the bacteria); c. some bacteria may have a genetic mutation (in their genome or plasmid) that makes them more resistant to the antibiotic; d. plasmid (with a resistant gene) can move from one bacteria cell to another; e. natural selection favours the bacteria with the resistance; f. these bacteria survive and reproduce ***OR*** plasmids reproduce increasing the spread of the mutation; g. resistant bacteria pass on the trait/genes of antibiotic resistance to their generation; h. in each generation the percentage of antibiotic resistant bacteria increases ***OR*** eventually the resistant strain is dominant, and the antibiotic is ineffective;		**5 max**