Cambridge Assessment International Education

Cambridge O Level

BIOLOGY **5090/22**

Paper 2 Theory **October/November 2023**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

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6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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Mark schemes will use these abbreviations:

; separates marking points
/ alternatives
() contents of brackets are not required but should be implied
R reject
A accept (for answers correctly cued by the question, or guidance for examiners)
Ig ignore (for incorrect but irrelevant responses)
AW alternative wording (where responses vary more than usual)
AVP alternative valid point (where a greater than usual variety of responses is expected)
ORA or reverse argument
underline actual word underlined must be used by candidate
+ statements on both sides of the **+** are needed for that mark

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Question	Answer	Marks	Guidance
1(a)(i)	pathogen ;	**1**	
1(a)(ii)	transmissible / communicable / infectious ;	**1**	
1(b)	protein synthesis **AW** ; plasmids ; membrane ; shape / support **AW** / turgidity ;	**4**	
1(c)(i)	2 ;;	**2**	1 mark for 100 or 100 000 divided by 50 000
1(c)(ii)	flagellum ; movement / swim / locomotion **AW** ;	**2**	
1(c)(iii)	*Vibrio* ; international **AW** / universal **AW** ;	**2**	
1(c)(iv)	**1** bacteria produce / release a toxin ; **2** chloride (ions) / Cl^- ; **3** ions into / increase in + intestine ; **4** reduction in / lower water potential + of intestine **ORA** ; **5** water into intestine / out of cells / water not absorbed from intestine ; **6** osmosis ;	**4**	

Question	Answer	Marks	Guidance
2(a)	all six organisms in a diagram ; producer/s and consumer/s linked by lines to reindeer ; correct arrow/s from (grasses ferns and mosses) to reindeer ; correct separate arrows from reindeer to wolves and bears ;	**4**	
2(b)(i)	carbon / C + hydrogen / H + oxygen / O ;	**1**	

Question	Answer	Marks	Guidance
2(b)(ii)	energy ; converted into + glycogen / fat / protein ;	**1**	**R** produces energy
2(b)(iii)	no enzyme **AW** ; no gene / no allele ;	**2**	

Question	Answer	Marks	Guidance
3(a)	(**Q**) pulmonary vein ; (**R**) renal artery ; (**U**) hepatic vein ;	**3**	
3(b)	<table><tr><td>**Q** – (pulmonary) vein</td><td></td><td>**R** – (renal) artery</td></tr><tr><td>thin + wall</td><td>+</td><td>thick + wall ;</td></tr><tr><td>thin muscle / thin elastic</td><td>+</td><td>thick muscle / thick elastic ;</td></tr><tr><td>wide + lumen **AW**</td><td>+</td><td>narrow + lumen **AW** ;</td></tr><tr><td>valves</td><td>+</td><td>no valves ;</td></tr></table>	**3**	/
3(c)(i)	**1** urea + into kidney **OR** kidney removes + urea ; **2** filtration / filtering ; **3** nephron / Bowman's capsule / glomerulus ; **4** urea + excreted / in urine ;	**3**	

Question	Answer	Marks	Guidance
3(c)(ii)	**1** (blood) glucose decreased / sugar low / body needs more sugar ; **2** glycogen ; **3** breakdown / hydrolysis + to glucose ; **4** glucose + passed out of liver / goes into U / hepatic vein / blood ; **5** (stimulated by) glucagon ;		

Question	Answer	Marks	Guidance
4(a)(i)	**1** low oxygen availability for fish **AW** ; **2** at low end (6.9) of pH range / at high end (40 ºC) of temperature range ; **3** for (aerobic) respiration ; **4** as pH increases solubility of oxygen increases **ORA** ; **5** as temperature increases solubility of oxygen decreases **ORA** ; **6** evidence of cross-referencing fish range to a graph by data quote ;	**3**	
4(a)(ii)	**1** useful in low / no oxygen ; **2** more + gas exchange / gases exchanged with air ; **3** more + oxygen available for fish ; **4** for (aerobic) respiration ; **5** to release energy ; **6** use of energy ;	**4**	
4(b)(i)	<u>nucleus</u> ;	**1**	
4(b)(ii)	<u>meiosis</u> ;	**1**	
4(b)(iii)	21 ;	**1**	

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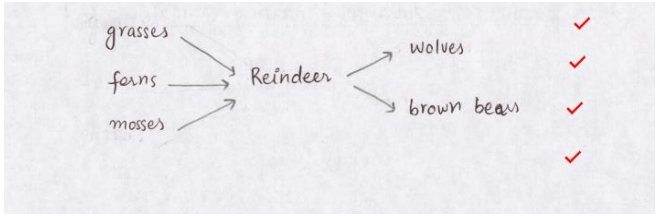
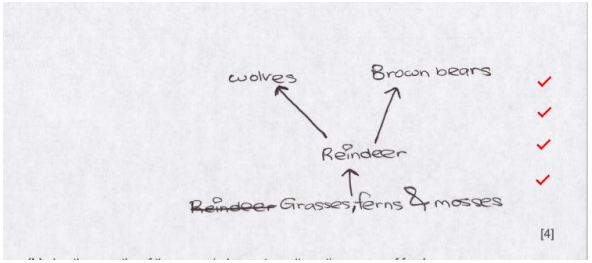
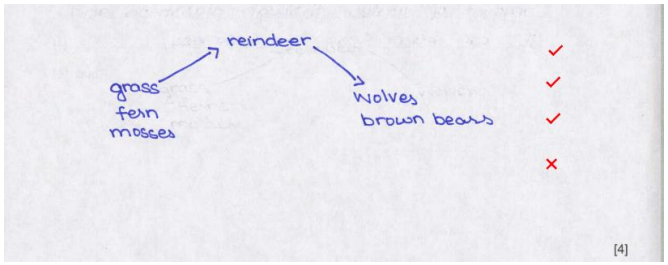
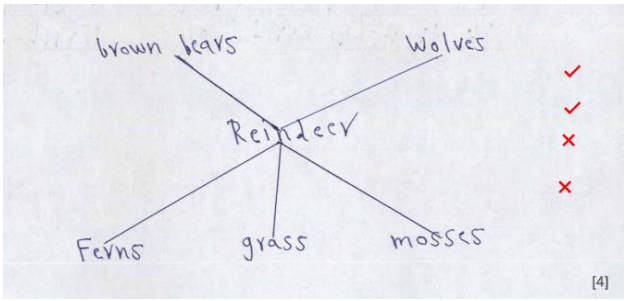
Question	Answer	Marks	Guidance
4(c)	**1** selection is by human ; **2** choose / select **AW** + desirable feature **AW** ; **3** crossing / breeding / offspring or next generation produced ; **4** (offspring) with best features selected to breed ; **5** repeated many times / many generations ;	**5**	

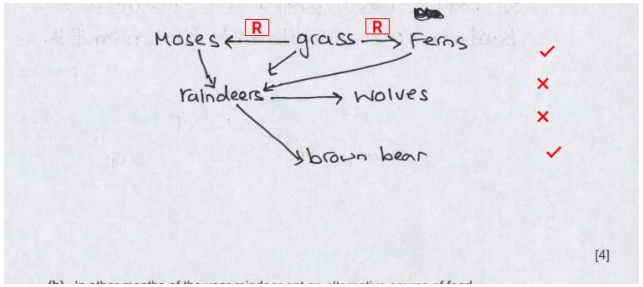
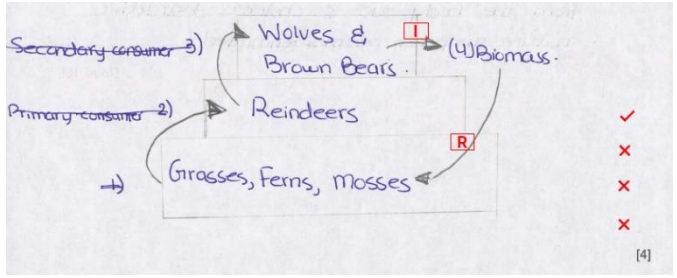
Question	Answer	Marks	Guidance
5(a)(i)	pectinase ;	**1**	**A** cellulase
5(a)(ii)	control / comparison ;	**1**	**A** purpose of control described e.g. to show how much juice is formed without an enzyme
5(b)	**1** beaker A produced more juice / beaker B less juice **AW** ; **2** beaker A / at 45 °C + enzyme working **AW** / effective collisions ; **3** beaker B / 90 °C + enzyme + denatured / changes shape ; **4** active site ; **5** substrate no longer + fits / binds / complementary **AW** ;	**5**	
5(c)	no ethical concerns ; presence of plasmids ; rapid + reproduction / multiplication / growth rate ; asexual reproduction / binary fission / genetically identical ; easy + to grow / produce / reproduced ; able to make complex molecules ;	**2**	

Question	Answer	Marks	Guidance
6(a)	(**J**) cuticle ; transparent / allows light through ; (**K**) palisade ; chloroplasts / chlorophyll + absorb light **AW** ; (**L**) lower epidermis ; guard cells / stomata ; carbon dioxide in / oxygen out ;	**6**	
6(b)	xylem ; **OR** phloem ; transpiration; transport + water / mineral ions ; in one direction / upwards **AW** ; support **AW** ; translocation ; transport + sucrose / amino acids ; up + or down ; source + to sink ;	**4**	

Question	Answer	Marks	Guidance
7(a)(i)	living (component) AW + non-living (component) AW + interacting AW ;;	**2**	*all three parts of answer = 2 marks, two parts = 1 mark* **accept** biotic / organisms /community /consumers and producers **ignore** humans **ignore** single species / a single population **accept** abiotic factors / environment / climate **ignore** habitat /only one abiotic factor **accept** working / living together etc.
7(a)(ii)	number + different species + in an area **AW**;	**1**	**ignore** population **accept** ecosystem /habitat for area
7(a)(iii)	(group of organisms) that can reproduce **AW**; to produce fertile offspring;	**2**	
7(b)	**1** education / raise awareness **AW**; **2** quotas / laws / regulations / protected areas / monitoring; **3** to reduce / stop + deforestation / cutting down trees; **4** trees cut from selected areas only **ORA**; **5** replanting / reforestation / trees replaced; **6** coppicing / pollarding; 7 produced as rapidly as removed / ensures it does not run out;	**5**	**accept** banned / fines as implies law **accept** rotational cutting **accept** afforestation, planting trees **accept** description **ignore** just 'sustainable resource' as in question **accept** trees replanted at same rate as trees cut down

Examples of food webs and marks

	all 6 organisms connecting lines producer arrow/s correct separate arrows to wolves and bears Total 4		all 6 organisms connecting lines arrow from grouped producers correct separate arrows to wolves and bears Total 4
	all 6 organisms connecting lines producer arrow/s correct NO separate arrows to wolves and bears Total 3		all 6 organisms connecting lines NO producer arrow/s NO separate arrows to wolves and bears Total 2

	all 6 organisms incorrect extra arrows between producers are a REJECT for M2 and M3 Total 2		all 6 organisms ignore incorrect irrelevant arrows relating to biomass /Sun/decomposers but the arrow between consumers and producers is a REJECT for M2, M3 and M4 Total 1