Cambridge Assessment International Education

Cambridge IGCSE™

BIOLOGY **0610/41**

Paper 4 Theory (Extended) **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.

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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	<u>Calculation specific guidance</u> 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	<u>Guidance for chemical equations</u> 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.

Mark scheme abbreviations

- **;** separates marking points
- **/** alternative responses for the same marking point
- **R** reject the response
- **A** accept the response
- **I** ignore the response
- ecf error carried forward
- AVP any valid point
- ora or reverse argument
- AW alternative wording
- underline actual word given must be used by candidate (grammatical variants excepted)
- ( ) the word / phrase in brackets is not required but sets the context

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Question	Answer	Marks	Guidance
1(a)(i)	Y is FSH **;** Z is LH **;**	**2**	
1(a)(ii)	*line drawn:* low until day 14 **;** increasing until day 21, then a decrease **;**	**2**	
1(a)(iii)	14 **;**	**1**	
1(a)(iv)	placenta **;**	**1**	
1(b)	Step 1: 0.029 (mm) **;** Step 2: 75 762 **;;** Step 3: 75 800 (%) **;**	**4**	MP1 for correct Step 1 conversion MP2 22 - 0.029 = 21.971mm in Step 2 MP3 (21.971 ÷0.029) x 100 = 75762 in Step 2 MP4 correct rounding to three significant figures ecf from previous step
1(c)	*any three from:* flagellum **;** (many) mitochondria **;** acrosome (containing enzymes) **;** haploid (nucleus) **/** AW **;**	**3**	

Question	Answer	Marks	Guidance
2(a)(i)	lacteal **;**	**1**	
2(a)(ii)	goblet (cell) **;**	**1**	
2(a)(iii)	trachea / bronchi / bronchioles / AVP **;**	**1**	

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Question	Answer	Marks	Guidance
2(a)(iv)	*any four from:* microvilli **;** (microvilli) provide a large surface area **;** epithelium / lining, one cell thick / thin / AW **;** ref. to diffusion **;** ref. to enzyme production **;** good blood supply **;** (good blood supply) to maintain a steep concentration gradient **;** ref. to lacteal / N, and fat transport **;** AVP **;**	**4**	
2(b)	hepatic portal vein **;**	**1**	
2(c)	*any two from:* unspecialised (cells) **;** that divide by mitosis **;** (to produce daughter cells) that become specialised (for specific functions) **;**	**2**	
2(d)	*any five from:* 1 mitochondria are site of <u>aerobic</u> respiration **;** 2 release energy **;** 3 heart / intestine (cells), respire more **;** 4 heart (cells) (continuously) contract **;** 5 epithelial cells need more energy **;** 6 active transport in the small intestine **;** 7 red blood cells need space, for haemoglobin / oxygen **;** 8 red blood cells, are moved in the blood / do not (actively) move **;** 9 red blood cells, take up/ release, oxygen by diffusion **;** 10 so no energy needed for active transport **;** 11 *idea that* it is good if RBCs do not use up the oxygen they transport **;** 12 AVP **;**	**5**	

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Question	Answer	Marks	Guidance
3(a)(i)	*any two from:* eggs laid in / larvae live in, water and adults live on land / AW **;** two stage life cycle / AW **;** gas exchange occurs through skin (and lungs) **;** larva have gills and adults have lungs **;** moist skin (described) **;** AVP **;**	**2**	
3(a)(ii)	**G** cornea **;** **H** lens **;**	**2**	
3(b)(i)	**K** (cell) membrane **;** **L** cytoplasm **;** **M** nucleus **;**	**3**	
3(b)(ii)	brain **and** spinal cord **;**	**1**	either order
3(c)(i)	**P** draw on the graph in the fovea (area on the graph where there is the highest number of cone cells and no rod cells) **;** **Q** draw on the graph in the blind spot (area on the graph where there are no cone cells or rod cells) **;**	**2**	

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Question	Answer	Marks	Guidance
3(c)(ii)	*any five from:* *describe:* 1 more rod cells than cone cells **;** 2 (number of) cone cells peak, in the middle / at the fovea **;** 3 there are no rod cells where the number of cone cells is highest **;** 4 ref. to uneven distribution of rod cells, either side of the, middle / fovea **;** 5 no rod cells **and** no cone cells at blind spot **;** *explanation:* 6 light absorbed (by a pigment) **;** 7 rods detect low light (intensity) **;** 8 (rods) do not detect colour **;** 9 (rods) provide night vision / AW **;** 10 (cones) detect high light (intensity) **;** 11 (cones) detect colour **;** 12 any detail, e.g. three different types of cone **;** 13 (no rods and cones at blind spot) because of optic nerve **;**	**5**	
3(c)(iii)	more rods present **and** no / fewer cones present **;** rods at the fovea / rods mainly at periphery **;**	**2**	**A** more rods than cones **A** more rods in the middle

Question	Answer	Marks	Guidance
4(a)	repair **;** asexual **;** separate **;** diploid **;** zygote **;** fertilisation **;**	**6**	
4(b)(i)	random **;** change in the base sequence of DNA **;**	**2**	
4(b)(ii)	ionising radiation **;** (named) chemicals **;** AVP **;**	**2**	

Question	Answer	Marks	Guidance
5(a)(i)	66 (%) **;**	**1**	
5(a)(ii)	1985 to 1990 **;**	**1**	
5(b)	*any three from:* reduction in genetic variation / reduced gene pool **;** inbreeding **;** *idea of* an increase in the frequency of recessive alleles **;** (described) consequence of having too many recessive alleles **;** risk of extinction **;** *idea of* unable to find mates / AW **;** AVP **;**	**3**	

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Question	Answer	Marks	Guidance
5(c)	*any six from:* 1 education / awareness **;** 2 monitoring the populations **;** 3 ref. to net type **;** 4 ref. to mesh size **;** 5 reduced demand (to eat from unsustainable fish stocks) **;** 6 alternative sources of fish **;** 7 treaties / licenses / fines / laws / making it illegal **;** 8 (legal) quotas / restricted catch weight **;** 9 no-catch zones / nursery zones / protected areas / Marine Protected Areas / AW **;** 10 fish farms **;** 11 closed fishing season / AW **;** 12 restocking / captive breeding and release **;** 13&14 AVP **;;**	**6**	

Question	Answer	Marks	Guidance
6(a)(i)	3 **;** 1 **and** 3 **;**	**2**	
6(a)(ii)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ **;;**	**2**	MP1 correct formulae MP2 correct balancing (of correct formulae)
6(a)(iii)	amylase **;** maltase **;**	**2**	either order
6(a)(iv)	(to build) cell walls / provide support **;**	**1**	
6(a)(v)	translocation **;** phloem **;** nitrate(s) **;**	**3**	
6(b)(i)	muscle **;**	**1**	

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Question	Answer	Marks	Guidance
6(b)(ii)	*any two from:* continuation of deeper breathing / faster breathing / AW **;** continuation of fast heart rate / AW **;** *idea of* delivering oxygen for the breakdown of lactic acid / delivering lactic acid to the liver to be broken down **;**	**2**	
6(b)(iii)	liver **;**	**1**	

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