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Cambridge Assessment International Education

# Cambridge IGCSE™

**BIOLOGY** **0610/42**

Paper 4 Theory (Extended) **February/March 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 February/March 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:<br><br>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:<br><br>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 | <u>'List rule' guidance</u><br><br>For questions that require ***n*** responses (e.g. State **two** reasons …):<br><br>• The response should be read as continuous prose, even when numbered answer spaces are provided.<br>• Any response marked *ignore* in the mark scheme should not count towards ***n***.<br>• Incorrect responses should not be awarded credit but will still count towards ***n***.<br>• 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.<br>• 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<br><br>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'.<br><br>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.<br><br>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.<br><br>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<br><br>Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.<br><br>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) | **B ;** | **1** | |
| 1(a)(ii) | **C ;** | **1** | |
| 1(a)(iii) | **A D E ;** | **1** | **A** in any order |
| 1(a)(iv) | separates the left side and the right side of the heart / separates right atria and ventricle from the left atria and ventricle **;**<br>keep deoxygenated blood and oxygenated blood separate **;** | **2** | |
| 1(a)(v) | blood flows through the heart twice in one circuit (of the body) **;**<br>there are two separate blood circuits / pulmonary circuit and systemic circuit / described **;** | **2** | |
| 1(b)(i) | arterioles **;** | **1** | |
| 1(b)(ii) | *any two from:*<br>(change in pressure) caused by contraction of <u>muscles</u> (of the, heart / ventricle) **;**<br>pressure increases when the, heart / ventricles, contract / pumps **;**<br>pressure decreases when the, heart / ventricles, relax **;**<br>pressure decreases as you move further from the heart / AW **;**<br>AVP **;** | **2** | |
| 1(b)(iii) | *any four from:*<br>*arteries:*<br>**1** thick / muscular, <u>wall</u> to withstand the high blood pressure **;**<br>**2** wall contains elastic tissue to stretch and recoil **;**<br>**3** (relatively) narrow / small, lumen maintains (high) blood pressure **;**<br>*veins:*<br>**4** (relatively) large / wide, lumen to provide less resistance for blood flow / AW (at low pressure) **;**<br>**5** large lumen to carry larger volume of blood **;**<br>**6** valves to prevent backflow (caused by low pressure) **;** | **4** | |

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(a)</td><td>1 Benedict’s solution in A, remains blue / no colour change / negative result, as there is no, maltose / breakdown of starch ;<br>2 Benedict’s solution in B, turns red / changes colour / positive result, in the presence of maltose ;<br>3 amylase breaks down starch ;<br>4 into maltose ;<br>5 (maltose) is a small / soluble, <u>molecule</u> ;<br>6 maltose is able to pass through the dialysis tubing ;<br>7 by diffusion ;<br>8 from an area of high concentration to low concentration / down a concentration gradient ;</td><td>6</td><td></td></tr>
<tr><td>2(b)</td><td><table>
<tr><td>pepsin</td><td>protein</td><td>amino acids / peptides</td></tr>
<tr><td>lipase</td><td>fats / oils / lipids</td><td>fatty acid and glycerol</td></tr>
<tr><td>trypsin</td><td>protein</td><td>amino acids / peptides</td></tr>
<tr><td>maltase</td><td>maltose</td><td>glucose</td></tr>
</table>;;;;</td><td>4</td><td>one mark for each correct row</td></tr>
<tr><td>2(c)</td><td>villi / microvilli ;</td><td>1</td><td></td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3(a)(i)</td><td>flowering plants ;<br>dicotyledons ;</td><td>2</td><td>I flowers<br>A dicots</td></tr>
</table>

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(a)(ii) | *any two from:*<br>one seed leaf / one cotyledon **;**<br>parallel veins **;**<br>adventitious / fibrous, roots **;**<br>flower parts in multiples of three **;**<br>vascular bundles throughout stem / AW **;**<br>narrow leaves **;** | **2** | |
| 3(b)(i) | 600 **;** | **1** | |
| 3(b)(ii) | meiosis **;**<br>reduction division / chromosome number is halved / single set of chromosomes (produced) **;**<br>producing genetically different, cells / spores **;**<br>ref to spore dispersal (by wind) / described**;** | **3** | |
| 3(b)(iii) | fertilisation **;** | **1** | |
| 3(c)(i) | (a group of) organisms that can reproduce **;**<br>to produce fertile offspring **;** | **2** | |
| 3(c)(ii) | anther correctly labelled **;**<br>stigma correctly labelled **;**<br>arrow drawn from anther to the stigma **;** | **3** | |
| 3(c)(iii) | **X** drawn in ovary **;** | **1** | |
| 3(c)(iv) | *any three from:*<br>**1** reliant on (named) pollinators / wind **;**<br>**2** *idea of* wastage of pollen / less chance of pollination **;**<br>**3** *idea of* more energy required **;**<br>**4** need to produce, more pollen / flowers / nectar **;**<br>**5** needs more than one plant **;**<br>**6** risk of less, fertilisation / reproduction **;**<br>**7** AVP **;** | **3** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(a)(i) | *any four from:*<br>**1** ref to <u>translocation</u> **;**<br>**2** carbohydrates / glucose / sugars / amino acids, made in the leaves OR ref to photosynthesis in leaves **;**<br>**3** glucose / carbohydrates, converted to sucrose **;**<br>**4** leaves act as a source **and** roots act as a sink **;**<br>**5** phloem transports <u>sucrose</u> / <u>amino acids</u> **;**<br>**6** sucrose / (named) sugars, collect above the girdle **;** | **4** | |
| 4(a)(ii) | xylem is still intact / idea that xylem is further inside the trunk **;**<br>mineral ions transported by xylem **;** | **2** | |
| 4(b) | *any three from:*<br>*idea that* glucose required, for (aerobic) respiration / to release energy / for ATP production **;**<br>ref. to active transport **;**<br>to transport mineral ions, from low to high concentration / against their concentration gradient **;** | **3** | |
| 4(c) | $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ **;;** | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(a) | contains (a group of) <u>receptor</u> cells **;**<br>that, detect / respond, to, light / (specific) stimuli **;** | **2** | |
| 5(b) | brain **;**<br>spinal cord **;** | **2** | **A** in either order |
| 5(c)(i) | blind spot labelled **;** | **1** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(c)(ii) | retina – **H** – contains, receptor (cells) / rods **and** cones<br>optic nerve – **G** – transmits impulses to the central nervous system<br>cornea – **D** – refracts light / allows light to enter the eye<br>**;;;** | **3** | one mark for each correct row |
| 5(d) | circular muscle and radial muscle **;** | **1** | **A** in either order |
| 5(e) | *any three from:*<br>ciliary muscles relax **;**<br>suspensory ligaments can no longer become taut **;**<br>lens, is not stretched / remains wide **;**<br>angle of refraction remains unchanged / AW **;** | **3** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(a) | plasmid **;**<br>restriction **;**<br>sticky **;**<br>gene **;**<br>(DNA) ligase **;**<br>recombinant (plasmid) **;**<br>asexual **;** | **7** | |
| 6(b) | *any two from:*<br>reproduce rapidly **;**<br>no ethical / welfare, issues **;**<br>ability to make complex molecules **;**<br>easy to maintain or store / don't take up too much space **;**<br>*idea that* share a genetic code with other (named) organisms **;** | **2** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(c) | *any three from:*<br>**1** (additional) nutrient / energy, content may be (too) small **;**<br>**2** seeds may be expensive to purchase **;**<br>**3** farmers unable to save seeds **;**<br>**4** ref. to side effects / (unknown) health risks, to consumers **;**<br>**5** risk of cross-contamination with wild rice **;**<br>**6** reduction, in biodiversity / genetic diversity **;**<br>**7** consumers won't buy GM products / ethical concerns **;**<br>**8** AVP **;** | **3** | |
| 6(d) | *scurvy* – vitamin C **;**<br>*rickets* – vitamin D / calcium **;** | **2** | |

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