Cambridge O Level

**Cambridge Assessment International Education**
Cambridge Ordinary Level

**BIOLOGY** **5090/22**

Paper 2 Theory **October/November 2019**

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.

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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. |

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) | stamen / anther / filament / androecium **;**<br>carpel / pistil / stigma / style / gynoecium **;**<br>correct length or height comparison between **pin** and **thrum ;** | **3** | |
| 1(b) | *type of pollination*<br>cross **;**<br><br>*advantage*<br>genetic / genes / alleles **;**<br>variation / different **;** | **3** | |
| 1(c)(i) | *pin* tt **;**<br>*thrum* Tt **;** | **2** | **A**Tt genotype to be written as tT |
| 1(c)(ii) | *pin gametes* *thrum gametes*<br>t + t **AND** T + t / T ;<br>*offspring genotypes*<br>Tt **+** Tt **+** tt **+** tt **OR** Tt **+** Tt **+** Tt **+**Tt ;<br><br>*ratio*<br>2:2 / 1:1 / $\frac{1}{2}$ / 2 out of 4 / 50% / half / 50:50 **OR** 100% / all **+** thrum **;** | **3** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(a)(i) | chloroplast ; | 1 | |
| 2(a)(ii) | carbon dioxide / $6CO_2$ + water / $6H_20$ ( ⟶ ) ;<br><br>( ⟶ ) glucose / $C_6H_{12}O_6$ + oxygen / $6O_2$ ; | 2 | |
| 2(b) | green ;<br>chlorophyll ; | 2 | |
| 2(c)(i) | genetic + engineering / modification ; | 1 | **Ig** biotechnology |
| 2(c)(ii) | increased / more / greater / higher / high ;<br><br>*any three from ...*<br><br>light + absorbed **AW** ;<br>photosynthesis ;<br>production **AW** of + glucose / starch / carbohydrate / sugar ;<br>growth / yield / protein synthesis / production of protoplasm ;<br>profit **AW** ; | 1<br><br><br><br>max 3 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(a)(i) | bacterium / bacteria / spirochete / treponema ; | 1 | |
| 3(a)(ii) | white (blood) cells / lymphocytes ; | 1 | **Ig** WBC |
| 3(a)(iii) | plasma ; | 1 | |
| 3(b)(i) | production **AW** + of antibodies **OR** time for immune response ; | 1 | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(b)(ii) | *test valid*<br>(**X**) yes **+**<br>(**Y**) yes **+**<br>(**Z**) no **;**<br><br>test for infection conclusive<br>(**X**) yes **+**<br>(**Y**) no **+**<br>(**Z**) no **;** | **2** | |
| 3(b)(iii) | *first symptom*<br>sore / ulcer / chancre **+** genitals / named genital / mouth / anus **;**<br><br>*type of drug*<br>antibiotic / named antibiotic **;** | **2** | **R** antibodies |
| 3(c)(i) | 83 / 83.3 / 83.33 **;** | **2** | **Ig** working shown if answer correct |
| 3(c)(ii) | not all tested / not all have symptoms / other reason for not being tested / not all reported / some unaware they are infected / tested too soon **AW ;** | **1** | |
| 3(c)(iii) | <u>condom</u> **;**<br>no sexual intercourse **;**<br>reduce / only one **+** sexual partner(s) **;** | **2** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(a)(i) | meat / fish / eggs / dairy products / nuts / pulses **;** | **1** | |
| 4(a)(ii) | stomach **;**<br>small intestine / duodenum / ileum **;**<br>protease / pepsin / trypsin / erepsin / rennin / peptidases **;**<br><br>into **AW +** amino acids / polypeptides / peptides / peptones **;** | **4** | |
| 4(b) | less / reduced / smaller / small / shorter / short **;**<br>area **;**<br>less **+** diffusion / active transport **;**<br>of **+** glucose / amino acids / fatty acids / glycerol / vitamins / minerals **;**<br>less **+** assimilation **;**<br>result of deficiency in a component named in **4 ;**<br>more food required in diet **AW ;** | **4** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5 | **(E no mark)**<br><br>**F** left column **only ;**<br><br>**J** left column **only ;**<br><br>**L** left column **only ;**<br><br>**G** middle column **only ;**<br><br>**H** middle column **only ;**<br><br>**K** right column **only ;** | **6** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(a) | <u>root hair</u> **;**<br><br>long / extension / projection / finger-like **AW ;**<br>increased / large **+** <u>surface area</u> **;**<br>uptake **AW** of **+** water **;**<br>osmosis / diffusion **;**<br>uptake **AW** of **+** ions / named ion / minerals / salts **;**<br><u>active transport</u> **;** | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(b) | red blood / erythrocyte ;<br><br>biconcave ;<br>increased / large + surface area ;<br>oxygen + in / out / contained / carried **AW** ;<br>oxygen + diffusion ;<br>no nucleus / anucleate ;<br>increased / large + volume / space ;<br>haemoglobin ;<br>oxygen + binding / attachment / combine **OR**<br>reference to oxyhaemoglobin ;<br>flexible / elastic / change shape / can squeeze ;<br>into / through + capillaries ; | **6** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(a) | aerobic ; | **1** | |
| 7(b) | **A** each point if stated correctly for **either** aerobic / oxygen available<br>**or** anaerobic / oxygen unavailable<br><br>reference to amount of energy ;<br>reference to speed / distance / endurance / amount of muscle activity **AW** ;<br>reference to lactic acid ;<br>reference to oxygen debt ;<br>reference to pain / cramp / fatigue ; | **4** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(c) | oxygen / air **+** breathed in / inhaled / inspired / into lungs **;**<br>diaphragm **+** contracts / moves down / flattens **;**<br>external **+** intercostal muscles contract **;**<br>alveoli / air sacs **;**<br>dissolve / solution **;**<br>mucus / moist lining **;**<br>diffusion **;**<br>blood / red blood cell / erythrocyte / haemoglobin / oxyhaemoglobin **;**<br>heart / atrium / ventricle **+** contracts / beats / pumps **;**<br>across **AW + ** membrane **;** | **5** | **Ig** any point if given with ref. to $CO_2$<br><br>**Ig** RBC |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 8(a) | deforestation **AW ;**<br>soil erosion / flooding / landslides **;**<br>desertification **AW** / less rainfall / drought / less transpiration **;**<br>loss of habitat **;**<br>extinction / loss of species / endangered species / loss of biodiversity **;**<br>loss of potential medicines **;**<br>carbon dioxide increase / oxygen decrease **;**<br>greenhouse effect / global warming / climate change **AW ;**<br>effect on food chain **;**<br>named effect on local people **;**<br>release **AW + ** sulfur dioxide / nitrogen oxides **;**<br>acid rain **;**<br>damage to trees / acidification of soil / acidification of rivers **AW ;** | **7** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 8(b) | non-cyclical / does not return to the Sun ;<br>producer + plant / named plant ;<br>photosynthesis ;<br>light into chemical ;<br>consumer / carnivore / herbivore ;<br>decomposers / decomposition ;<br>(energy) lost / not all passed on ; | **3** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 9(a) | gamete(s) ;<br>egg(s) / ovum / ova + sperm ;<br>fuse / join / combine **AW** ;<br>zygote ;<br>cell division ;<br>mitosis ;<br>embryo / blastula / blastocyst / morula ; | **4** | |
| 9(b) | oxygen + respiration ;<br>glucose + respiration ;<br>amino acids + protein synthesis / growth / cell division ;<br>ions / vitamins / minerals / salts / antibodies + for named use ;<br>removal **AW** of + carbon dioxide / urea ;<br>placenta ;<br>umbilical cord ;<br>diffusion ;<br>capillaries ;<br>mother's blood + fetus' **AW** blood ; | | |

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