Cambridge O Level

**Cambridge Assessment International Education**
Cambridge Ordinary Level

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

Paper 2 Theory **May/June 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.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

**PUBLISHED**

## 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.

| |
|---|
| 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:

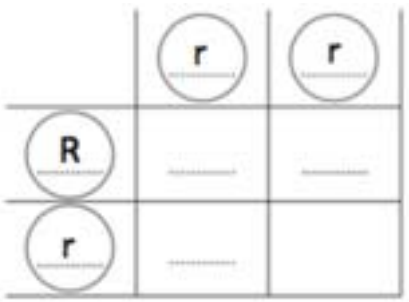
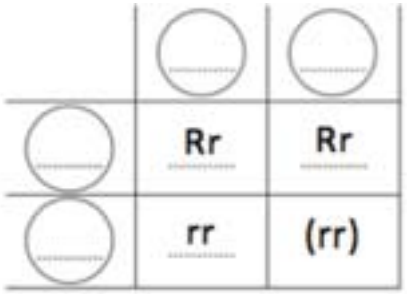
| | |
|---|---|
| **;** | separates marking points |
| **/** | alternatives |
| **()** | contents of brackets are not required but should be implied |
| **R** | reject |
| **A** | accept (for answers correctly cued by the question, or guidance for examiners) |
| **Ig** | ignore (for incorrect but irrelevant 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 |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(a)(i) | enzyme(s) / protein(s) / catalyst(s) ; | 1 | |
| 1(a)(ii) | starch + maltose / glucose ;<br>protein / polypeptide + amino acids / polypeptides / peptides / peptones ;<br>fat / oil / lipid / triglyceride + fatty acids **and** glycerol ; | 3 | |
| 1(a)(iii) | break down / digest / hydrolyse ;<br>cellulose ; | 2 | |
| 1(b) | stomach + acid / pH below 7.0 ;<br>tablet does not break down / contents not released + stomach ;<br>prevents enzyme + denaturation / destruction / inactivity ;<br>small intestine / duodenum + alkali / pH above 7.0 ;<br>tablet breaks down / contents released + small intestine / duodenum ;<br>optimum **AW OR** fastest rate **AW** ; | 3 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(a)(i) | **1** (light) enters / refracted **AW** / converged / travels through (bacterium) ;<br>**2** (light) detected / absorbed / received **AW +** by receptors ;<br>**3** fibres contract ;<br>**4** movement towards light ;<br><br>**5** **sequence mark**: if point(s) **1** / **2** appear before point(s) **3** / **4** ; | 3 | |
| 2(a)(ii) | more **AW +** light ;<br>chlorophyll ;<br>photosynthesis ;<br>produce **AW +** glucose / starch / carbohydrate / sugar ; | 2 | |
| 2(b) | (**A**) cornea / lens / aqueous humour / vitreous humour ;<br>(**B**) retina / photoreceptors / fovea / yellow spot / rods / cones ; | 2 | |
| 2(c) | (uses) nitrogen + gas / in air / atmospheric ;<br>produce **AW +** ammonium ; | 2 | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(d)(i) | photosynthesis ;<br>oxygen **+** produced / released **AW** ; | **2** | |
| 2(d)(ii) | any suggested method of having less oxygen present ;<br>any suggested method of keeping oxygen away from enzyme ;<br>mutation ; | **1** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(a) | (**C**) testa / seed coat ;<br>(**D**) plumule ;<br>(**E**) radicle ;<br>(**F**) cotyledon(s) ; | **4** | |
| 3(b)(i) | nucleus / chromosome(s) / DNA ; | **1** | |
| 3(b)(ii) | *gene*<br>made of DNA / section of a chromosome ;<br>copied / passed on / inherited / hereditary ;<br>one **AW +** characteristic / trait / protein / polypeptide ;<br><br>*dominant allele*<br>version / form / type **+** of a gene ;<br>expressed **AW +** always / if only one copy present / by heterozygote / over another allele ; | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(b)(iii) | **1**   ;<br>**2**   ;<br>**3** (genotype of **J**) Rr / heterozygous ; | **3** | **2,3 A** Rr genotypes to be written as rR |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(a) | discontinuous ; | **1** | |
| 4(b)(i) | eat / consume / feed on **+** plant / producer ; | **1** | |
| 4(b)(ii) | three / 3 / third / consumer / secondary consumer / carnivore ; | **1** | |
| 4(c) | variation / varieties ;<br>mutation ;<br>camouflage **AW** ;<br>survive / not eaten / get more food **OR** not seen by **+** predators / prey ;<br>reproduce / breed / offspring / population increase ;<br>pass on **+** gene / allele ; | **5** | **A** reverse argument for responses that refer to a frog in the area to which it is less well adapted |
| 5(a) | (**K**) combustion / burning ;<br>(**L**) respiration ;<br>(**M**) photosynthesis ;<br>(**N**) decomposition / decay / rotting / respiration ; | **4** | **(L) Ig** aerobic / anaerobic<br><br>**(N) Ig** decomposers / bacteria / fungi |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(b)(i) | award **either** the number marking point **or** the number star marking point in each instance – e.g. award **either 1 or 1*** but **do not** award both<br><br>(any month from May to Sep **/** long days / point **3** awarded)<br>**1** falls **AW** / low / lowest / more removed from air **;**<br>**2** more **+** leaves / foliage **;**<br>**3** more / long(er) **+** light / daylight **;**<br>**4** more / fast(er) **+** photosynthesis **;**<br>**5** carbon dioxide **+** used in photosynthesis **;**<br>**6** photosynthesis faster than respiration **;**<br><br>(any month from Sep to May / short days / point **3*** awarded)<br>**1*** rises **AW** / high / highest / more released into air **;**<br>**2*** less **+** leaves / foliage **;**<br>**3*** less / short(er) **+** light / daylight **;**<br>**4*** less /slow(er) **+** photosynthesis **;**<br>**5*** carbon dioxide **+** produced in respiration **;**<br>**6*** respiration faster than photosynthesis **;** | **3** | |
| 5(b)(ii) | line drawn from y-axis to middle of grid **+** shows **only** a trough **;**<br>line drawn from middle of grid to end of grid **+** shows **only** a peak **;** | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(a) | *blood vessel* ***P***<br>pulmonary vein ;<br>oxygenated blood ;<br>from lungs / to heart / to left atrium ; | **3** | |
| 6(b) | *structure* ***Q***<br>left ventricle / muscle ;<br>pumps / contracts / pushes blood ;<br>high pressure ;<br>blood to **+** body / aorta ; | **3** | |
| 6(c) | *structure* ***R***<br>valve ;<br>atrioventricular / tricuspid ;<br>opens **+** blood into right ventricle ;<br>closes **+** blood into pulmonary artery / blood to lungs ;<br>prevent backflow **AW +** of blood ;<br>(prevents backflow) into right atrium ; | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(a)(i) | reflex / involuntary **;** | **1** | |
| 7(a)(ii) | **1** impulse **;**<br>**2** synapse **;**<br><br>**3** from **+** receptor **;**<br>**4** sensory / afferent **;**<br>**5** relay / inter / intermediate **;**<br>**6** CNS / spinal cord **;**<br><br>**7** motor / efferent **;**<br>**8** to **+** effector **;**<br>**9** muscle / named muscle correct for withdrawal reflex **;**<br><br>**10** **sequence mark**: point(s) **3**/**4**/**5**/**6** must be ticked before point(s) **7**/**8**/**9 ;** | **7** | |
| 7(b) | impulse **+** not transmitted **AW ;**<br>effector / named effector **+** not activated **AW ;** | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 8(a) | diffusion ;<br>down concentration gradient / from high to low concentration ;<br>plasma / hydrogencarbonate / $HCO_3^-$ ;<br>capillary ;<br>dissolves **+** mucus / moist lining / water film ;<br>alveoli / air sac ;<br>exhalation / expiration / breathed out ;<br>intercostal muscles relax **OR** internal intercostal muscles contract ;<br>ribs **+** down / in / fall ;<br>diaphragm **+** relaxes / moves up / becomes domed ;<br>decreased volume / increased pressure ;<br>(out through) bronchioles / bronchi / bronchus / trachea ; | **7** | |
| 8(b) | photosynthesis ;<br>reacts with **+** water ;<br>light **+** energy ;<br>produce **AW +** glucose / starch / carbohydrate / sugar ;<br>chlorophyll / chloroplasts ; | **3** | |

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>9(a)</td><td>root <u>hair</u> ;<br>cell wall ;<br>membrane ;<br>partially AW + permeable ;<br>osmosis / diffusion ;<br>stem ;<br><u>xylem</u> ;<br>leaf / mesophyll ;<br>water film ;<br>air / intercellular AW + spaces ;<br>out of / through + stomata / guard cells ;<br>transpiration / evaporation / water vapour ;</td><td>7</td><td></td></tr>
<tr><td>9(b)</td><td>
<table>
<tr><th>factor ;</th><th>variation ;</th><th>explanation ;</th></tr>
<tr><td>temperature / heat</td><td>high / higher AW</td><td>increased AW + <u>evaporation</u> / <u>water vapour</u></td></tr>
<tr><td>wind / air movement</td><td>fast / faster AW</td><td>fewer water <u>molecules</u> outside / increased concentration gradient</td></tr>
<tr><td>light</td><td>high / higher AW</td><td>stomata / guard cells + open</td></tr>
<tr><td>humidity / moisture in air</td><td>low / lower AW</td><td>fewer water <u>molecules</u> outside / increased concentration gradient</td></tr>
</table>
</td><td>3</td><td></td></tr>
</table>