Cambridge International AS & A Level

**Cambridge Assessment International Education**
Cambridge International Advanced Subsidiary and Advanced Level

**BIOLOGY** **9700/22**

Paper 2 AS Level Structured Questions **March 2019**

MARK SCHEME

Maximum Mark: 60

**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 scheme abbreviations**

| | |
|---|---|
| **;** | separates marking points |
| **/** | alternative answers for the same point |
| **R** | reject |
| **A** | accept (for answers correctly cued by the question, or by extra guidance) |
| **AW** | alternative wording (where responses vary more than usual) |
| **underline** | actual word given must be used by candidate (grammatical variants accepted) |
| **max** | indicates the maximum number of marks that can be given |
| **ora** | or reverse argument |
| **mp** | marking point (with relevant number) |
| **ecf** | error carried forward |
| **I** | ignore |
| **AVP** | alternative valid point |

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| Question | Answer | Marks |
|---|---|---|
| 1(a) | **A** = palisade mesophyll **;**<br>**B** = epidermis **;**<br>**C** = spongy mesophyll **;** | **3** |
| 1(b) | ***accept*** *ora throughout*<br><br>*any* ***three*** *from:*<br><br>*Erica v Cedrus:*<br>curled / rolled, leaf (v not, curled / rolled) **;**<br>hairs / trichomes (v no trichomes) **;**<br>no hypodermis / AW v hypodermis / layer of cells below epidermis / layer of cells between epidermis and palisade mesophyll **;**<br>**A** ref. to two layers of outer cells in *Cedrus*<br><br>AVP **; ;**<br>e.g. *Erica* has thicker cuticle<br>*Erica* has larger epidermal cells<br>sunken stoma visible in Cedrus<br>*Cedrus* has cylindrical / needle-shaped, leaf **A** circular <u>in (cross-) section</u><br>*Cedrus* has lower surface area to volume ratio **;** | **3** |
| 1(c) | *any* ***three*** *from:*<br><br>*idea that* stomata, only open during the day / open during the day and close at night **;**<br><br>*statements about gas exchange:*<br>stomata open to obtain (enough) carbon dioxide for photosynthesis **;**<br>**A** carbon dioxide not required at night<br><br>*statement about transpiration*:<br>(most) water vapour lost via open stomata **;**<br>very little water (vapour) lost via cuticle **;**<br><br>**I** ref. to temperature | **3** |

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| Question | Answer | Marks |
|---|---|---|
| 2(a) | *any **four** from:*<br><br>1 globular protein **;**<br>**A** spherical / ball-shaped<br>**I** circular<br><br>2 acts as a catalyst **;**<br>3, 4 further detail **; ;**<br>e.g. increases the rate of a reaction (cf. to no enzyme)<br>**A** speeds up a reaction / makes the reaction go faster<br>does not get used up (in the reaction)<br>**I** does not take part in the reaction<br>**A** can be re-used<br>**A** is not changed (by the reaction)<br>does not alter the (chemical) equilibrium (between reactants and products)<br><br>5 lowers the, activation energy / energy needed for substrate to reach transition state **;**<br>6 detail **;**<br>e.g. holds substrate to place strain on bond (for bond to break)<br>holds substrates, in position / close, for bonds to form<br>facilitates transfer of, electrons / protons<br><br>7 effective in tiny quantities / AW **;**<br><br>8 shows specificity / active site shape complementary to substrate / forms enzyme–substrate complex / lock and key or induced fit mechanism of action **;**<br><br>9 AVP **;**<br>e.g. may need, cofactor / coenzyme / prosthetic group, to function<br>each has an optimum, temperature / pH | **4** |

| Question | Answer | Marks |
|---|---|---|
| 2(b) | carbon dioxide / $CO_2$ + water / $H_2O$ ; body tissues ⇌ lungs ; carbonic acid / $H_2CO_3$ ;<br><br>*one mark for each side of the equation*<br>*allow one mark only if, wrong way round / carbonic acid shown as proceeding to dissociate* | **2** |
| 2(c) | *any **four** from:*<br><br>*primary:*<br>sequence of amino acids not shown ;<br>**A** cannot see primary structure of amino acids<br><br>*secondary:*<br>alpha / α, -helices shown ;<br>beta / β, -pleated sheets shown ;<br>(areas of) random arrangement shown ;<br><br>*tertiary*:<br>folding / coiling, (of polypeptide chain) shown / ref. to 3-D configuration ;<br>globular shape shown ;<br>interactions between, R-groups / side-chains, (of amino acids) not shown ;<br>ref. to any two bond types not shown ;<br>e.g. H bonds / disulfide bridges / ionic bonds / hydrophobic interactions<br>folding allows presence of zinc / AW ; | **4** |

| Question | Answer | Marks |
|---|---|---|
| 3(a)(i) | ***accept*** *ora throughout*<br><br>*any* ***four*** *from:*<br><br>*(case) incidence:*<br>1 only Lao PDR increase in (case) incidence / AW **;**<br>2 Papua New Guinea has greatest reduction **;**<br>3 numerical data extracted from Fig. 3.1 to support **;**<br><br>*mortality (rate):*<br>4 all countries have a reduction **;**<br>5 Cambodia greatest reduction<br>**A** Cambodia **and** Lao PDR<br>**or**<br>Solomon Islands least reduction **;**<br>6 numerical data extracted from Fig. 3.1 to support **;** | **4** |
| 3(a)(ii) | *any* ***two*** *from:*<br><br>nets prevent entry of, mosquito / *Anopheles* **;**<br>**A** in context of covering containers with water<br>insecticide, kills **/** reduces number of, mosquitoes / *Anopheles* **;**<br>(female) mosquito / *Anopheles*, is vector / transmits parasite / AW **;**<br>feeds / takes blood meal, (mainly) at night / when people sleeping **;**<br>(helps to) break the transmission cycle **;** | **2** |
| 3(b)(i) | *any* ***two*** *from:*<br><br>1 testing for the presence of different, antigens / (*Plasmodium*) proteins **;**<br>2 antibodies are, specific / have specific shape **;**<br>**A** ref. to complementarity<br>3 different monoclonal antibodies have, different, variable regions / <u>antigen</u> binding sites **;**<br>4 (pLDH / HRP-2 / *Plasmodium*) protein, binds to / complexes with, (monoclonal) antibody **;** | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 3(b)(ii) | *any **two** from:*<br><br>(positive result of test strip 1) pLDH present, (so) the person, has malaria / is infected by *Plasmodium* **;**<br>**I** species names<br><br>(negative result of test strip 2) HRP-2 not present, (so) the cause of malaria is not / the person is not infected by, *P. falciparum* **;**<br>(negative result of test strip 2) HRP-2 not present, (so) the person is infected by *Plasmodium* other than *P. falciparum* / AW **;** | **2** |

| Question | Answer | Marks |
|---|---|---|
| 4(a) | *any **three** from:*<br><br>right ventricle pumps blood to lungs (and back to heart) and left ventricle pumps blood to (rest of) body (and back to heart) / AW **;**<br><br>(so) short(er) / less, distance (for blood to travel) / ora **;**<br><br>less resistance (to, flow / overcome) / ora **;**<br><br>less force / lower pressure, required / ora **;** | **3** |
| 4(b) | *any **two** from:*<br><br>ventilation / breathing (movements) / inspiration / inhalation, brings in oxygen **;**<br>blood flow (in pulmonary capillaries) removes oxygen **;**<br><br>oxygen binding to haemoglobin / oxyhaemoglobin formation, (removes oxygen) **;**<br>deoxygenated blood arriving / blood arriving low in oxygen **;** | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 4(c)(i) | *any **one** from:*<br><br>*in context of, airways / trachea / bronchi:*<br>*less air because:*<br>diameter of lumen decreases / ref. to smooth muscle contraction ;<br>inflammation ;<br>thicker layer of mucus ;<br><br>smoke present in inhaled air (so lower proportion of air) ;<br><br>AVP ; | **1** |
| 4(c)(ii) | *any **two** from:*<br><br>carbon monoxide (present in smoke) binds to haemoglobin ;<br>ref. to competitive / permanent / irreversible, binding ;<br>presence of carbon monoxide (from smoke) lowers affinity of haemoglobin for oxygen ;<br>ref. to carboxyhaemoglobin formed ;<br>comparatively less haemoglobin per red blood cell to bind oxygen ; | **2** |

| Question | Answer | Marks |
|---|---|---|
| 5(a) | *any **one** from:*<br><br>provides energy for the, production / secretion, of milk ;<br>a substrate to form, milk sugar / lactose (in milk) ;<br>AVP ; | **1** |

| Question | Answer | Marks |
|---|---|---|
| 5(b)(i) | (pale) blue / lilac / mauve / purple / AW ; <br> green / yellow / orange / red / green / yellow / orange / red ; | **2** |
| 5(b)(ii) | *any **two** from:*<br><br>reducing sugar / glucose, diffused, into tubing<br>**or**<br>reducing sugar / glucose, moved into tubing, down a concentration gradient / from high to low concentration **;**<br><br>reducing sugar / glucose, small enough to move across tubing (so positive result in tubing and in beaker) **;**<br>hPRL / protein, too large to move into tubing (so only positive result in beaker) **;**<br><br>only movement of glucose was tested so no explanation possible for reducing sugars in general **;** | **2** |
| 5(c) | *any **two** from:*<br><br>facilitated diffusion **;**<br>uses (transport / carrier / integral membrane) proteins **;**<br>specific / specific binding site **;**<br>conformational change / AW **;** | **2** |

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| Question | Answer | Marks |
|---|---|---|
| 5(d) | *any **four** from:*<br><br>1 hPRL is cell signalling molecule **;**<br>2 acts on target, cells / tissues **or** acts on cells with PRLR **;**<br>3 PRLR is (cell surface membrane) receptor **;**<br>4 hPRL binds to PRLR **;**<br>5 complementary binding / ref. to specificity **;**<br>6 leads to / sets off, (specific) responses in mammary gland cell<br>**or**<br>detail **;** e.g. secondary messenger triggered<br>enzymes activated | **4** |

| Question | Answer | Marks |
|---|---|---|
| 6(a) | *any **two** from:*<br><br>asexual reproduction **;**<br>growth by increase in number of cells **;**<br>(tissue) repair **;**<br>regeneration of body parts **;**<br>replacement of, dead / worn out, cells **;** | **2** |
| 6(b) | *any **one** from:*<br><br>spindle / spindle fibre **;**<br>kinetochore **;** | **1** |
| 6(c) | **A** phosphate **;**<br>pentose **;**<br>**B** pyrimidine **;**<br>**C** ribose **;**<br>**D** transcription **;** | **5** |

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| Question | Answer | Marks |
|---|---|---|
| 6(d)(i) | non-cellular / acellular / not made of cells **;**<br>protein coat / capsid **;**<br>nucleic acid core / DNA or RNA **;**<br>AVP **; ; ;** e.g. only replicate inside host cells<br>ref. to no characteristics of living organisms (sensitivity, growth, etc.)<br>ref. to size, e.g. most are smaller than bacteria<br>ref. to capsomeres | **3** |
| 6(d)(ii) | 500 (nm) **;** | **1** |

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