Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2018**

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: 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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Mark schemes will use these abbreviations

- **;** separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- **ecf** credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(a)</td><td>(food) is broken down into smaller pieces (without chemical change) ;

sites of mechanical digestion:
mouth / buccal cavity (in context mechanical) ;
stomach (in context of mechanical) ;

chewing / mastication ;
role of a named teeth ;;
ref to involvement of tongue ;
ref to movement of the jaw ;
churning / muscular, action of the stomach ;</td><td>4</td><td></td></tr>
<tr><td>1(b)</td><td><table><tr><th>part of the alimentary canal</th><th>enzyme</th><th>substrate</th><th>product(s)</th></tr><tr><td>mouth</td><td>amylase</td><td>starch</td><td>maltose</td></tr><tr><td>stomach</td><td>pepsin</td><td>protein</td><td>peptides</td></tr><tr><td>small intestine / duodenum / ileum</td><td>lipase</td><td>fat</td><td>fatty acids and glycerol</td></tr></table>;;;</td><td>3</td><td>one mark per row

A protease (for enzyme)

R pancreas (for part of the alimentary canal)</td></tr>
<tr><td>1(c)(i)</td><td><u>glycogen</u> ;</td><td>1</td><td></td></tr>
<tr><td>1(c)(ii)</td><td><u>antibody</u> ;</td><td>1</td><td></td></tr>
<tr><td>1(c)(iii)</td><td>(thermal) insulation ;</td><td>1</td><td>A storage / protection</td></tr>
</table>

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Question	Answer	Marks	Guidance
2(a)(i)	(external) ears / pinna(e) **;** fur / hair **;** whiskers **;**	**2**	
2(a)(ii)	inherited / genetic, feature **;** result of natural selection **;** increases fitness **;** increases chances of survival / AW **;** increases chances of, reproducing / AW **;**	**3**	
2(b)	temperature **;** light (intensity) **;** water (supply) / *idea that* water is not available (as frozen) **;** (named) soil feature **;** (named) mineral ion **;** carbon dioxide **;** grazing / predation **;** (competition for) space **;** disease **;** (named) pollutant **;**	**3**	**A** humidity

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Question	Answer	Marks	Guidance
2(c)	little energy available from, herbivores / primary consumers / lower trophic level(s) **;** few producers / low population of producers / AW **;** energy is lost, between / within, trophic levels / along food chain **; ora** ref to 10 % energy transfer / 90% energy loss (between trophic levels) **; ora** energy lost, in named process **;;;** low numbers of, prey / (primary) consumers / food **;** wolves not very successful at catching prey **;** reason why **;** e.g. prey are widely dispersed / larger animals lower reproductive rate / higher mortality of wolves **;** hunting / killed by people **;** reason why **;** e.g. for fur / compete with humans for food habitat destruction (by humans) **;** reason why **;** e.g. road building / oil exploration / melting of snow disruption of food web (described) **;** disease **;** inbreeding / reduced genetic diversity **;** <u>climate change</u> / <u>global warming</u> **;**	**6**	

Question	Answer	Marks	Guidance
3(a)(i)	**A** (upper) epidermis **;** **B** palisade (mesophyll) **;**	**2**	
3(a)(ii)	(cell surfaces are sites of) gas exchange **;** movement of gases by diffusion **;** *ref. to* efficient / faster / AW, gas exchange / diffusion / photosynthesis **;** carbon dioxide is, raw material / needed, for photosynthesis **;** absorption of carbon dioxide (when light available) **;** loss of oxygen (when light available) / absorption of oxygen **;** oxygen is required for (aerobic) respiration **;** more evaporation **;** *idea of* maximising light absorption **;**	**3**	
3(a)(iii)	allows for, movement of (named) gases / diffusion / gas exchange, throughout the whole of the leaf **;** *ref. to* faster / efficient / AW, diffusion / gas exchange **;** allows / AW, photosynthesis / respiration / transpiration / evaporation **;** *ref. to* storage of carbon dioxide **;** (air spaces) connect (to outside air) via stomata **;**	**2**	
3(b)(i)	no / little, water **;** high temperature **;** low humidity / dry air **;** high wind speed **;** long day length / high light intensity **;** high salinity / salt **;** freezing **;** disease **;** (soil) waterlogging / low oxygen concentration / pH **;** mineral / magnesium, deficiency **;**	**2**	**A** drought / no, rainfall / precipitation / irrigation

Question	Answer	Marks	Guidance
3(b)(ii)	*ref to* osmosis **;** water, lost from / moves out of, cells / vacuoles **;** down water <u>potential</u> gradient **;** pressure of, water / cell contents, on (inelastic) cell wall decreases **;** *correct ref. to* turgor / turgidity **/** flaccid / plasmolysed **;** *ref. to* plants / cells, rely on water, for (structural) support / to prevent wilting **; ora** water in cells not being replaced as quickly (as it is being lost) **;** AVP **;;**	**4**	
3(b)(iii)	stomata close **;** to prevent more water loss **;** water conserved for, other processes / other parts of plant **;** decrease surface area, exposed to the Sun / for absorption of heat **;**	**2**	**A** reduces transpiration

Question	Answer	Marks	Guidance
4(a)(i)	chemical / substance, produced by a gland **;** transported in the blood (plasma) **;** alters the activity of one of more specific target, organs / tissues / cells **;**	**2**	
4(b)(i)	retina **;**	**1**	
4(b)(ii)	fovea **;**	**1**	
4(b)(iii)	sensory (neurone / nerve cell) **;**	**1**	
4(b)(iv)	optic **;**	**1**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4(b)(v)</td><td>spinal cord ;</td><td>1</td><td></td></tr>
<tr><td>4(b)(vi)</td><td>adrenal (gland) ;</td><td>1</td><td></td></tr>
<tr><td>4(c)</td><td><table><tr><th>organ</th><th>effect of the hormone</th></tr><tr><td>heart</td><td>increased, pulse / heart, rate / beat ;</td></tr><tr><td>liver</td><td>conversion of glycogen to glucose /
increased blood glucose (concentration) ;</td></tr><tr><td>lungs</td><td>increase, (rate) / depth, of breathing ;</td></tr><tr><td>eyes</td><td>dilated pupils /
radial muscles (in iris) contract ;</td></tr></table></td><td>4</td><td></td></tr>
<tr><td>4(d)</td><td>nervous system, responds quickly / immediately ; ora
idea that (nerve) impulses travel to, (specific) muscles / (adrenal) glands / effector(s) ;
effects of endocrine system are long lasting ; ora
hormones / adrenaline, travels throughout the body / allows multiple (target) organs to respond (to same signal) ;
idea that less energy required than to have nerves going to every, cell / tissue ;
stimulate both voluntary and involuntary responses (simultaneously) ;
more effective / enhanced, response (than using one system alone) ;</td><td>4</td><td></td></tr>
<tr><td>4(e)(i)</td><td>auxin ;</td><td>1</td><td></td></tr>
<tr><td>4(e)(ii)</td><td>2,4-D is a weedkiller / AW ;
sprayed on crops / applied to leaves ;
specific to broadleaved weeds ;
does not affect, cereals / narrow-leaved crop plants ;
causes uncontrolled growth ;</td><td>2</td><td></td></tr>
</table>

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Question	Answer	Marks	Guidance
5(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) **;;**	**2**	one mark for correct symbols one mark for correct balancing
5(b)	0.42 (ppm s^{-1}) **;**	**1**	
5(c)	to allow oxygen to enter the chamber **;** keep the crickets respiring <u>aerobic</u>ally **;** to remove carbon dioxide **;** to prevent death of crickets **;** *ref. to* ethical treatment of animals **;** maintaining similar conditions / resetting, for repeat readings / AW **;**	**2**	
5(d)	heat (energy) is released by crickets **;** movement / *ref. to* kinetic energy **;** pressure increase **;** increased carbon dioxide leading to greenhouse effect **;** small closed space **;**	**2**	
5(e)	rate of oxygen consumption increases with body mass of crickets (for each temperature) **;** any suitable data quote comparing rate at different masses (at same temperature) **;** rate of oxygen consumption increases with temperature **;** any suitable data quote comparing rate at two temperatures (for the same body mass) **;**	**4**	**A** respiration for oxygen consumption

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Question	Answer	Marks	Guidance
6(a)	<table><tr><th>process / event</th><th>letter from Fig. 6.1</th><th>name of the organ</th></tr><tr><td>meiosis to produce pollen grains</td><td>C</td><td>anther</td></tr><tr><td>pollination</td><td>D</td><td>stigma</td></tr><tr><td>development of seeds</td><td>E</td><td>ovary</td></tr><tr><td>protection of flower in the bud</td><td>A</td><td>sepal</td></tr></table> **;;;;**	**4**	*one mark per row*
6(b)(i)	image size ÷ magnification **;**	**1**	
6(b)(ii)	82 (µm) **;**	**1**	
6(b)(iii)	(covered in) spikes / sticky **;** (pollen) sticks to, insect / animal (bodies / legs / AW) **;** large(r) size (in comparison with wind) **;** AVP **;**	**2**	
6(c)(i)	ovule **;**	**1**	
6(c)(ii)	(nucleus) containing one set of (unpaired) chromosomes **;**	**1**	
6(c)(iii)	so that chromosome number does not double (at fertilisation) **;** so that chromosome number remains constant from generation to generation **;**	**1**	

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