Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **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.

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This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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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.

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).

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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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Question	Answer	Marks	Guidance
1(a)	yeast ;	**1**	
1(b)(i)	flour / starch / sugar / glucose / sucrose / carbohydrate ;	**1**	
1(b)(ii)	respiration ;	**1**	
1(b)(iii)	carbon dioxide ;	**1**	
1(c)	*step 3 / 35 °C / low(er) temperature:* optimum / best / suitable / AW, temperature for, respiration / enzymes / gas production ; to allow the dough to, rise / expand / AW ; *step 5 / 200 °C / high(er) temperature* organism **A** / microorganisms / yeast, killed / enzymes denature ; to cook the dough ; to allow ethanol to evaporate ;	**2**	
1(d)	biofuels ; wine / beer, making ; penicillin / antibiotic (production) ; AVP ;;	**2**	

Question	Answer	Marks	Guidance
2(a)	burning / use, (named) fuels ; deforestation / AW ; increased human population ; example of named relevant human activity ; AVP ;	**3**	
2(b)	*description:* rate (of photosynthesis) peaks at, 12:00 / midday / noon ; photosynthesis starts at, 06:00 / stops at, 20:00 / 8 pm ; rate (of photosynthesis) at 550 (ppm) / AW, is greater than at, 370 (ppm) / AW ; both plots / 550 and 370 ppm, follow same trend / pattern ; comparative data quote between two plots with units at least once ; *explanation:* maximum light at 12:00 / dark until 6:00 / after, 20:00 / 8 pm ; *reference to* light intensity as a limiting factor ; because light is required for photosynthesis ; *reference to* CO_2 as a limiting factor ; (at high atmospheric CO_2) the concentration gradient (to air spaces) is steeper / diffusion is faster ; effect of CO_2 concentration is most at high light intensities ; ora *reference to* temperature as a limiting factor ; higher temperature causes increased rate of photosynthesis ; ora AVP ;	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(c)</td><td>
epidermis
<table>
<tr><th>feature</th><th>adaptation</th></tr>
<tr><td>transparent / clear / no chloroplasts</td><td>allows light to pass through ;</td></tr>
<tr><td>thin / flat</td><td>so less cytoplasm / more light, to pass through / AW ;</td></tr>
<tr><td>guard cells / stomata</td><td>allow gases to enter / leave the leaf / gas exchange ;</td></tr>
</table>
mesophyll
<table>
<tr><th>feature</th><th>adaptation</th></tr>
<tr><td>contains many chloroplasts (palisade)</td><td>trapping light energy ;</td></tr>
<tr><td>vertically / tightly, packed / column-shaped (palisade)</td><td>maximise light received (by cells) / reduce number of, cross / cell, walls ;</td></tr>
<tr><td>contain (air) spaces / loosely packed (spongy)</td><td>for diffusion / movement of gases (within leaf) ;</td></tr>
</table>
</td><td>4</td><td>one mark per row, max two from each tissue</td></tr>
<tr><td>2(d)</td><td>more carbon dioxide in the blood ;
low pH / acid, in blood ;
(high) carbon dioxide detected by brain ;
increases impulses to (named) muscles used in breathing / AW ;
correct reference to negative feedback / homeostasis ;</td><td>2</td><td></td></tr>
</table>

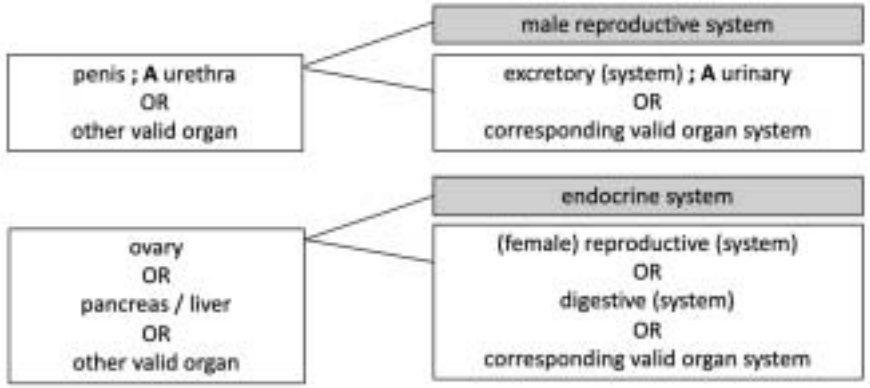
Question	Answer	Marks	Guidance
3(a)(i)	1.2×10^8 (g) / 120 000 000 (g) / 1.2×10^5 (kg) / 120 000 (kg) **;;** kg or g (per day) **;**	**3**	
3(a)(ii)	avoid too much (named) sugar in diet **;** flossing **;** regular visits to, dentist / hygienist / AW **;** AVP **;**	**1**	
3(b)(i)	diatom (→) lugwom (→) (wading) bird **;** arrows in correct direction **;**	**2**	
3(b)(ii)	*description:* more ammonium ions remain in bucket / less ammonium, absorbed (by diatoms) **;** less faeces **;** higher respiration rates **;** lower body mass **;** *explanation:* less, diatoms / food / ammonium ions, for lugworms **;** (high respiration of lugworms) to, release more energy / for finding food / stress etc. **;** slower growth rate of (lugworms) **;** (non-biodegradable) microplastics (negatively) affect digestion **;**	**4**	
3(c)(i)	protein / urea / amino acid **;**	**1**	
3(c)(ii)	nitrification **;**	**1**	
3(c)(iii)	plants absorb (nitrogen as) nitrate (ions) **;** needed to make, amino acids / (named) proteins **;** to make DNA / RNA / nucleotides / bases **;** protein / DNA, is needed for, growth / cell division / mitosis **;**	**3**	

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Question	Answer	Marks	Guidance
3(d)	visual pollution ; chokes / strangles / traps / blocks digestive systems / AW (of animals) ; *reference to*, chemical exposure / fumes / toxins ; (plastic) accumulates in an organism / is passed down a food chain ; (described) habitat destruction ; e.g. plastic covers the habitats (plastic) blocks (light / water for) photosynthesis (for land plants) ; (plastic) block roots / prevents root growth ; remain in the ecosystem (for a very long time) ; AVP ;	**5**	

Question	Answer	Marks	Guidance
4(a)	long, to transmit (impulse), over (long) distance / faster / direct connection **;** mitochondria to (release energy), for transmission impulse / protein synthesis / active transport / making (neuro)transmitters **;** vesicles to, carry / hold / release, chemicals / (neuro)transmitters (into synapse) **;** (neuro)transmitters are released, to allow connection to other neurones / across a synapse **;** receptors / vesicles, allow unidirectional transmission **;** AVP **;;**	**3**	
4(a)(ii)	brain and spinal cord (only) **;**	**1**	
4(b)(i)	stimulus / light (detected by) retina / rod / cone / receptor **;** *reference to* (electrical) impulse **/** electrical signal **;** sensory neurone → relay / connector, neurone → motor neurone **;** *reference to* synapses between neurones **;** effector / (circular) muscles (in iris), contract / respond **;**	**3**	
4(b)(ii)	automatic / involuntary **;** receptors / neurones / nerve, still function **;**	**1**	
4(c)(i)	**E** – vesicle **;** **F** – neurotransmitter **;** **G** – (neurotransmitter) receptor (molecule / site / protein) **;**	**3**	
4(c)(ii)	arrow drawn from right to left, pointing left **;**	**1**	

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Question	Answer	Marks	Guidance
5(a)(i)	testosterone ;	1	
5(a)(ii)	one mark per box but organ system must match organ ;;;;  	4	
5(b)	to produce, gametes / sperm ; for <u>sexual</u> reproduction ; to halve the number of chromosomes / produce haploid cells ; so that when fertilisation occurs the number of chromosomes return to the, same / diploid, number / AW ; creates (genetic) variation / AW ;	3	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5(c)(i)</td><td>
<table>
<tr><th>letter</th><th>name</th><th>function</th></tr>
<tr><td>P</td><td>acrosome</td><td>contain enzymes / digests jelly coat ;</td></tr>
<tr><td>Q</td><td>haploid nucleus</td><td>contains / AW, DNA / half number / unpaired, single set of / chromosomes / genes ;</td></tr>
<tr><td>R</td><td>mitochondrion ;</td><td>releases energy</td></tr>
<tr><td>S</td><td>flagellum</td><td>swimming / AW ;</td></tr>
</table>
</td><td>4</td><td>one mark per row</td></tr>
<tr><td>5(d)</td><td>drawing detail ;
additional drawing detail / any drawn and labelled common cell structure e.g. nucleus, cytoplasm, cell membrane, mitochondria / DNA / ribosome / (r)ER ;
drawn and labelled unique cell structure ; e.g. jelly (coat) / energy store / protein-rich layer / yolk / large volume of cytoplasm</td><td>3</td><td></td></tr>
<tr><td>5(e)</td><td>jelly coat (of fertilised egg) hardens ;
reference to zygote ;
mitosis / cell division ;
embryo forms ;
moves down oviduct ;
AVP ; e.g. use of nutrients in cytoplasm</td><td>3</td><td></td></tr>
</table>

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Question	Answer	Marks	Guidance
6(a)	(group of) organisms that can reproduce ; produce fertile offspring ;	**2**	
6(b)	genetically identical ; quick ; can reproduce even if variety is sterile ; described consequence of being genetically identical ; AVP ; e.g. no pollinators required / reliable / no harmful variation	**3**	
6(c)	energy (store / sink) ; example of use of starch in plant ; as a reserve / source / store (of energy), when plant cannot photosynthesise / dormancy / winter / no leaves / dark / night ; AVP ; e.g. insoluble	**2**	

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