Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/41**

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.

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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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Abbreviations used in the Mark Scheme

• **;**	separates marking points
• /	separates alternatives within a marking point
• **R**	reject
• **ignore**	mark as if this material was not present
• **A**	accept (a less than ideal answer which should be marked correct)
• AW	alternative wording (accept other ways of expressing the same idea)
• underline	words underlined (or grammatical variants of them) must be present
• max	indicates the maximum number of marks that can be awarded
• mark independently	the second mark may be given even if the first mark is wrong
• ecf	credit a correct statement that follows a previous wrong response
• ( )	the word / phrase in brackets is not required, but sets the context
• **ora**	or reverse argument
• AVP	any valid point

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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>A substrate ;
B active site ;
C enzyme-substrate complex ;
D product(s) ;</td><td>4</td><td></td></tr>
<tr><td>1(b)</td><td>production of, small(er) / soluble / simple(r), <u>molecules</u> ;

(small molecules can be) absorbed / ref. to absorption ; ora

(moves through) cell membranes / wall of intestine / into blood / into cells ;</td><td>2</td><td></td></tr>
<tr><td>1(c)</td><td>
<table>
<tr><th>function</th><th>letter from Fig. 2.1</th><th>name of structure</th></tr>
<tr><td>site of starch digestion</td><td>A
J / E</td><td>mouth / buccal cavity
small intestine</td></tr>
<tr><td>reabsorption of water</td><td>J / E
H
F</td><td>small intestine
colon / large intestine
rectum</td></tr>
<tr><td>secretion of pepsin</td><td>C</td><td>stomach</td></tr>
<tr><td>site of maltose digestion</td><td>J / E</td><td>small intestine</td></tr>
<tr><td>secretion of bile</td><td>K
L</td><td>liver
gall bladder</td></tr>
<tr><td>storage of faeces</td><td>F</td><td>rectum</td></tr>
<tr><td>secretion of lipase and trypsin</td><td>D</td><td>pancreas</td></tr>
</table>
;;;;;;</td><td>6</td><td>one mark per row
the letter must agree with the name
if more than one letter or name mark first one only

A J/E small intestine</td></tr>
</table>

Question	Answer	Marks	Guidance
2(a)	(the probability that an organism will) survive and, reproduce / AW **;**	**1**	
2(b)(i)	(during the day they) remain in a burrow / stay in the shade / stay inactive / sleep / AW **;** light colour / pale / yellow / white (fur / hair) / AW **;** thin / long, tail / legs **;** thin / short / little, fur **;** no fur on legs **;** fur on feet **;** large, ears / pinna(e) **;** little / no, fat **;** large surface area: volume ratio **;** produces, little / concentrated, urine **;** AVP **;**	**2**	**A** nocturnal (habit) **A** ref. to long kidney tubules / AW
2(b)(ii)	big eyes / large pupils / good eyesight **;** whiskers **;** lots of rods (in the retina / fovea) **;** large ears / good sense of hearing / sensitive ears **;** good sense of smell **;**	**2**	 **A** eye has no cones
2(c)(i)	block added to the top of the pyramid that is 4 small squares wide **;** labelled carnivores **;**	**2**	
2(c)(ii)	(detritivores) eat (mainly), plants / producers **;** (detritivores) feed, at second trophic level / as primary consumers **;** detritivores are eaten by, third trophic level / secondary consumers **;**	**1**	
2(c)(iii)	little energy is transferred from one trophic level to the next **; ora** not all of the organisms are, eaten / digested / absorbed **;** named example of energy loss **;** *idea that* not enough energy to support higher trophic levels **;**	**2**	

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Question	Answer	Marks	Guidance
2(c)(iv)	*idea that* in a pyramid of numbers one large individual is shown in the same way as one very tiny individual **; ora** biomass indicates how much food there is, available / left **;** biomass is an indicator of the energy available **;** pyramid of biomass is pyramid shaped whereas a pyramid of numbers is not always **; ora** AVP **;**	**3**	

Question	Answer	Marks	Guidance
3(a)(i)	label line and **X** pointing to any part of the 'star' in the centre of the root section **;**	**1**	
3(a)(ii)	composed of (group of) cells with similar structures **;** working together to perform shared functions **;**	**2**	
3(b)	xylem supplies water **;** air spaces **;** large (internal) surface area **;** water evaporates from surface of mesophyll cells **;** guard cells, open / close, stomata **;** water vapour, diffuses / moves, out through stomata **;**	**3**	

Question	Answer	Marks	Guidance
4(a)(i)	sensory neurone / (temperature / thermo-) receptor (neurone) **;**	**1**	
4(a)(ii)	**Q** venule **;** **S** arteriole **;** **T** capillary **;**	**3**	
4(a)(iii)	fat / fatty tissue **;**	**1**	

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Question	Answer	Marks	Guidance
4(b)(i)	blood flow remains constant **and** then increases / AW **;** blood flow remains at, 4 / 5% **;** increase in blood flow from 25 (±2) °C **;** to, maximum / 100%, at 41 °C **;**	**3**	
4(b)(ii)	detection by, sensory neurone / receptor (in skin) **;** brain / hypothalamus, as control centre / AW **;** impulses in, motor / effector, neurones **;** muscles in, shunt vessels contract / arterioles relax **;** so shunt vessels, constrict / close **;** arterioles dilate / vasodilation **;** increased / more, blood flow, into capillaries / near surface (of skin) **;**	**3**	**A** brain / hypothalamus, detecting temperature
4(b)(iii)	46 (%) **;**	**1**	
4(b)(iv)	diffusion **;** down concentration gradient / high to low concentration **;** active transport **;** through epidermis **;** between / into / through, cells **;** across cell membranes **;** AVP **;**	**3**	
4(c)	(so that) enzymes do not denature / enzymes remain active / maintains optimum temperature for enzymes **;** *idea of* maintaining a constant rate of, reactions / metabolism / respiration **;** avoids to damage to other named (type of) protein **;** avoids damage to cell membranes **;** avoids, heatstroke / hyperthermia / overheating / dehydration / freezing / chills / becoming too cold / hypothermia **;** at high temperature sperm production, reduced / harmed **;** AVP **;**	**4**	e.g. (permits) colonisation of different parts of the world / different climates active in, both day and night / different seasons

Question	Answer	Marks	Guidance
4(d)	hormones are chemicals / hormonal coordination is only chemical **;** transported in the, blood / circulatory system **;** (effects are) slower (than nerves) **; ora** (effects are) longer lasting **; ora** each hormone may have more than one target, organ / tissue / cells **; ora**	**3**	

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)	150(%) **;;**	**2**	one mark for correct working if answer wrong
5(c)	demand for, energy / oxygen, increases **;** (rate of) respiration increases **;** limited supply of oxygen to muscle (tissue) **;** *idea that* heart / pulse / breathing, rate not increased enough **;** muscles respire anaerobically **;** lactic acid is produced **;**	**3**	
5(d)	horses continue to breathe, at high rate / deeper **;** continue with a high, heart / pulse, rate **;** to provide, enough / AW, oxygen (to 'pay-off' the debt) **;** lactic acid, moves / diffuses / AW, (from muscle) into blood **;** lactic acid transported to the liver **;** (in the liver) lactic acid is, broken down / oxidised / respired (aerobically) **;**	**4**	
6(a)(i)	process / event — letter from Fig. 6.1 meiosis — **R ;** fertilisation — **S ;** implantation — **V ;**	**3**	

Question	Answer	Marks	Guidance
6(a)(ii)	oviduct **;**	**1**	
6(b)(i)	image size ÷ actual size **;**	**1**	
6(b)(ii)	55 (µm) **;**	**1**	
6(c)	haploid / *n* / one set of chromosomes / half the diploid number / 23 chromosomes **;** (produced by) meiosis **;** so number of chromosomes, remains the same / does not double at fertilisation **;**	**2**	**A** so diploid number restored at fertilisation / so zygote is diploid
6(d)	*flagellum* (flagellum) propels the sperm **;** to, oviduct / site of fertilisation / egg (cell) / ovum **;** *mitochondria* aerobic respiration **;** provides / releases / supplies, energy / ATP **;** *acrosome* (contains / has / releases) enzyme(s) **;** (enzymes) digest / break down / dissolve, jelly coat / protein layer **;** so sperm nucleus can enter the egg cell / so sperm and egg membranes can fuse together **;**	**6**	**A** flagellum allows sperm to swim **R** 'produces energy'
6(e)	*idea that* sex is determined by X and Y chromosomes / males are XY and females are XX **;** egg cells have X chromosome / females can only provide X chromosome **;** sperm cells have X or Y chromosome / only the males can provide X or Y chromosome / only males can provide the Y chromosome **;**	**2**	

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