Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/41**

Paper 4 Theory (Extended) **October/November 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.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved 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.

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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 scheme abbreviations

- **;** separates marking points
- **/** alternative responses for the same marking point
- **R** reject the response
- **A** accept the response
- **I** ignore the response
- ecf error carried forward
- AVP any valid point
- ora or reverse argument
- AW alternative wording
- underline actual word given must be used by candidate (grammatical variants excepted)
- ( ) the word / phrase in brackets is not required but sets the context

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Question	Answer	Marks	Guidance
1(a)(i)	sun / light ;	**1**	
1(a)(ii)	**C** ;	**1**	
1(a)(iii)	ingestion / feeding / AW ;	**1**	
1(a)(iv)	energy is lost (from the food chain as it is transferred from one trophic level to the next) / energy decreases up the trophic levels ; only 10% energy transferred ; ora energy is lost as heat / in respiration / in (named) metabolic processes / movement ; not all organisms (in one trophic level) are eaten / not all parts of the organisms are eaten ; not all nutrients in the organisms are, eaten / digested / absorbed some energy is lost in, excretion / urine / faeces ; some energy is transferred to decomposers ;	**3**	**A** energy transfer is inefficient **A** egestion
1(b)(i)	organisms that get energy from dead / waste, (organic) material ;	**1**	
1(b)(ii)	respiration ;	**1**	
1(c)	combustion / burning ; (more / less) fossil fuel is used ; concentration of (atmospheric) carbon dioxide is increasing ; deforestation described ; trees not replanted / fewer trees ; ora described effect on photosynthesis ; carbon dioxide released (into the atmosphere), as the trees are burnt / decay ; causing, global warming / <u>enhanced</u> greenhouse effect ; *ref. to* tundra thaw and methane ; rate of fossilisation is slower than rate of combustion / fossil fuels are non-renewable ; positive human activities / carbon capture technology ; (idea of) loss of equilibrium / balance ;	**5**	

Question	Answer	Marks	Guidance
2(a)	fungus **;**	**1**	
2(b)	small / no, clear area / AW **;** ora (antibiotic in disc), not killing bacteria / (continued) reproduction **;** ora	**2**	**A** more bacteria growing
2(c)(i)	**1** correct ref. to mutation (of bacteria) / have resistance gene **;** **2** mutation is a change in the DNA / base sequence **;** **3** mutations can be caused by, (ionising) radiation / (named) chemicals **;** **4** variation (in ability of bacteria to survive antibiotic treatment) **;** **5** ref. to (natural) selection / evolution **;** **6** bacteria with resistance (survive and) reproduce / breed / multiply / produce offspring **;** **7** bacteria with, no / little, resistance, die / do not reproduce **;** **8** (bacteria that survive) pass on the resistance, allele / gene, to more bacteria **;** **9** bacteria reproduce quickly **;** **10** exposure to antibiotics acts as a selection pressure **;** **11** only use antibiotics when essential **;** **12** complete the full course of prescribed antibiotics **;** **13** isolation of patients with infections ; **14** improved, healthcare / sanitation / nutrition / good diet / hygiene / cleanliness / screening / AW **;** **15** and **16** AVP **;;**	**6**	
2(c)(ii)	viruses, are not alive / not made of cells / AW **;** ora viruses do not have, a cell wall / named cell component **;**	**1**	

Question	Answer	Marks	Guidance
2(d)	small / take up little space ; reproduce rapidly / easy to grow ; contain plasmids ; transformation described / genetic modification / inserting genes ; no ethical concerns ; same genetic code as other organisms ; same DNA ; can make complex molecules / AW ; AVP ;	**3**	

Question	Answer	Marks	Guidance Notes
3(a)	no, cytoplasm / (named organelle) / hollow ; *ref.* to lignin (in walls) (cell walls) are waterproof / water impermeable / AW (secondary) thickening of cell wall ; long / elongated (cells / vessels / tubes) ; (bordered) pits (for water movement between vessels) ; no, (perforated) end / cross walls (between cells) / end plates to connect vessels (end to end) ;	**3**	
3(b)	(water enters) root hair (cells) / **M** ; by <u>osmosis</u> ; the soil has a higher <u>water potential</u> than the root (cells) ; ora water moves from an area of high(er) water potential to low(er) water potential ; active transport of ions to create a water potential gradient ; (across / through partially permeable), membrane(s) ; *ref to* root cortex / **L** – cortex / **M** to **L** to **(K)** to **J** ; AVP ;	**5**	
3(c)(i)	87 ;;	**2**	

Question	Answer	Marks	Guidance
3(c)(ii)	the nearer the tip / zone 1, the lower flow rate **;** ora flow rate increases (from tip to bulb) in both treated and healthy roots **;** flow rate is greater in zone 1 in the treated roots **;** flow rate is lower in zones 2 and 3 in the treated roots **;** ora comparative data quote with units **;**	**3**	
3(c)(iii)	xylem vessels are dead, so toxins / treatment have no effect **;** osmosis / water flow into root, does not rely on living cells / energy / is passive / AW **;** AVP **;**	**2**	

Question	Answer	Marks	Guidance
4(a)	<table><tr><th>function</th><th>name of part</th><th>letter on Fig. 4.1</th></tr><tr><td>carries impulses to the brain</td><td>optic nerve</td><td>**Y ;**</td></tr><tr><td>focuses light onto the back of the eye</td><td>lens</td><td>**S ;**</td></tr><tr><td>controls the tension of the suspensory ligaments</td><td>ciliary, muscles / body</td><td>**Q ;**</td></tr><tr><td>tissue the detects light and colour</td><td>retina</td><td>**W ;**</td></tr><tr><td>location of most cone cells</td><td>fovea</td><td>**X ;**</td></tr></table>	**5**	one mark for each correct row
4(b)(i)	antagonistic **;**	**1**	
4(b)(ii)	accommodation **;**	**1**	

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Question	Answer	Marks	Guidance
4(c)	cones are less sensitive in low light ; cones detect colour ; rods work in low light but can't detect colour / AW ;	**2**	
4(d)(i)	X^BX^b ;	**1**	
4(d)(ii)	X^bY ;	**1**	
4(d)(iii)	solid shaded square on Fig. 4.2 ;	**1**	
4(d)(iv)	one X chromosome from each parent / an X from father ; mother does not have any colour-blind alleles / father passes on one colour-blind allele ; (all female offspring are) heterozygous / X^BX^b ;	**2**	

Question	Answer	Marks	Guidance Notes
5(a)(i)	chemical substance produced by a (endocrine) gland ; carried by the blood ; alters the activity of specific target organs / AW ;	**3**	
5(a)(ii)	(insulin) stimulates enzymes (production) ; conversion of glucose to glycogen ; glycogen is stored / insoluble ; increased, uptake / absorption / respiration, of glucose by liver (cells) ;	**2**	
5(b)(i)	deamination / removal of nitrogen containing part (of amino acids) ; to form urea ; (part of) amino acid converted to ammonia ; ammonia converted to urea ;	**2**	
5(b)(ii)	(protein) synthesis ;	**1**	

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Question	Answer	Marks	Guidance
5(c)(i)	aerobic / using oxygen ; respiration / (to produce) carbon dioxide and water; *ref. to* enzymes ; AVP ; converted back to, glucose	**2**	
5(c)(ii)	as alcohol consumption increases risk of dying of liver disease increases ; similar trend in males and females ; comparative data quote with units for g per day ; men exponential / women are not exponential / AW ; at low consumption females have higher risk ; ora same risk at 112 g per day ;	**4**	

Question	Answer	Marks	Guidance
6(a)(i)	reflex (action) ;	**1**	
6(a)(ii)	contains antibodies / passive immunity / *idea of* fighting infections ; bonding with mother /AW ; is at a suitable body temperature ; sterile / less risk of infection / contamination ; convenience / always available / no preparation ; cheap / free ; easy to digest / less risk of colic / less risk of diabetes in child ; no additives / less risk of allergies ; *idea of* volume is controlled / no over-feeding ; nutrient requirements met / change with age / change with development ; AVP ;;	**4**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6(b)(i)</td><td>
<table>
<tr><td>enzyme</td><td>substrate</td><td>product(s)</td></tr>
<tr><td>amylase</td><td>starch</td><td>glucose / maltose ;</td></tr>
<tr><td>maltase</td><td>maltose</td><td>glucose ;</td></tr>
<tr><td>protease</td><td>protein</td><td>amino acids ;</td></tr>
</table>
</td><td>3</td><td></td></tr>
<tr><td>6(b)(ii)</td><td>high temperatures denature enzymes / AW ;
low temperatures result in low energy / fewer collisions / slower reactions / AW ;
enzymes work best / most efficient at optimum temperature ;</td><td>2</td><td></td></tr>
<tr><td>6(b)(iii)</td><td>pH ;
enzyme concentration ;
substrate concentration ;</td><td>1</td><td></td></tr>
</table>

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