Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/43**

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.

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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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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(a)(i)</td><td>root(s) ;</td><td>1</td><td></td></tr>
<tr><td>1(a)(ii)</td><td>small intestine ;</td><td>1</td><td></td></tr>
<tr><td>1(a)(iii)</td><td>it is a solvent ;
AVP ;</td><td>1</td><td></td></tr>
<tr><td>1(b)</td><td>
<table>
<tr><th>description</th><th>name of process</th><th>letter on Fig. 1.1</th></tr>
<tr><td>dissolved nitrate ions draining into rivers from farmland</td><td>leaching</td><td>F</td></tr>
<tr><td>algae blooms in water caused by leaching of nitrate ions</td><td>eutrophication</td><td>G / O ;</td></tr>
<tr><td>conversion of liquid / water, to, vapour / gas</td><td>evaporation</td><td>O ;</td></tr>
<tr><td>conversion of water vapour into liquid water molecules</td><td>condensation</td><td>P ;</td></tr>
<tr><td>loss of water from plants by evaporation / vapour / $H_2O(g)$ from plant</td><td>transpiration</td><td>H ;</td></tr>
</table>
</td><td>4</td><td>one mark per row</td></tr>
<tr><td>1(c)(i)</td><td>prevent (spread of named waterborne) diseases / infections ;
remove / kill, (named) pathogens ;</td><td>1</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
1(c)(ii)	**1** (polluted) water piped, to sewage treatment works / through **J** / to **K, L,M,N** ; **2** screening / removal of, large pieces of waste ; **3** flocculation / coagulation, to separate suspended particles ; **4** settling of, particles / grit / gravel ; **5** digestion by, bacteria / fungi / decomposers / microorganisms ; **6** with aeration (tank) / trickle filter / activated sludge ; **7** sludge treated with <u>anaerobic</u> decomposers / <u>anaerobic</u> digestion ; **8** (water) treated with, chlorine / ozone / UV (light) ; **9** distillation / collection of water from evaporator ;	**4**	**A** settlement tank / sedimentation **A** digestion in reed beds **A** charcoal beds / reverse osmosis

Question	Answer	Marks	Guidance
2(a)	6 ;	**1**	**A** 3 pairs
2(b)	different lengths of (sex) chromosomes ; different banding (patterns) of (sex) chromosome ; different numbers of (sex) chromosomes ; female has XX (chromosomes) and male has, XYY / AW (chromosomes) ; female chromosomes are same as each other / male chromosomes differ from each other ;	**2**	
2(c)	(meiosis) produces gametes ; (gametes) are haploid ; gametes / AW, are genetically different (from each other) ; fusion of <u>gametes</u> ; at random ; zygotes / offspring / AW, are genetically different (from parent) ; sexual reproduction causes variation ; AVP ;	**4**	

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Question	Answer	Marks	Guidance
2(d)	an allele is a version of a gene **;** mutations (can cause new alleles to form) **;** change in the base / DNA, sequence **;** (ionising) radiation / (named) chemicals, cause mutations **;** AVP **;**	**3**	

Question	Answer	Marks	Guidance
3(a)(i)	cell membrane / cell wall / cytoplasm / vacuole / nucleus **;;**	**2**	
3(a)(ii)	epidermis **;**	**1**	
3(a)(iii)	allows light through **;** (light) reaches chloroplasts / chlorophyll **;** in mesophyll / palisade cells **;** (palisade / mesophyll / chloroplasts / chlorophyll) need light for photosynthesis / trap energy from light **;**	**3**	
3(b)	for gas exchange **/** diffusion of gases **;** for, photosynthesis / respiration / transpiration **;;** correct gas with direction for named process **;;** controls the rate of, diffusion / transpiration / photosynthesis **;** ref. to transpiration <u>pull</u> **;**	**3**	**A** *ref. to* prevent, wilting / water loss
3(c)(i)	move against the concentration gradient **;** proteins (in membrane) **;** using energy **;** from respiration **;**	**2**	

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Question	Answer	Marks	Guidance
3(c)(ii)	high(er) ion concentration results in large(r) (guard cell) volume ; ora comparative data quote with units to support any description ; high(er) ion concentration causes low(er) water potential ; ora (high ion concentration causes) water to move into (guard) cells ; across partially / AW, permeable membrane ; by osmosis ; large cell volume correlates with high turgor pressure ; ora because cell water / membrane / cytoplasm / vacuole, pushes more on cell wall ;	**5**	
3(c)(iii)	lack of water ; high temperature ; low humidity / dry air ; wind ; AVP ;;	**2**	

Question	Answer	Marks	Guidance
4(a)(i)	conversion / process, needs energy ; aerobic respiration occurs (in mitochondria) ; (aerobic) respiration releases energy ;	**2**	
4(a)(ii)	enzyme ;	**1**	
4(b)	from the mother ; glucose (in mother / fetus) carried in blood ; glucose) diffuses / moves from high concentration to low concentration ; across the placenta ; (through) umbilical cord ; AVP ;	**3**	
4(c)(i)	chemical substance produced by a (endocrine) gland ; carried by the blood ; alters the activity of specific target organs / AW ;	**3**	

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Question	Answer	Marks	Guidance
4(c)(ii)	182 (%) ;;	**2**	
4(c)(iii)	*max four from mp1 to 6:* **1** no glycogen (measured) until day 10 / at first (measurable) / AW, glycogen concentration is 200–220 µmol per g ; **2** small / no, change / decrease, in glycogen until day 20–26 ; **3** glycogen increases from day 20 - 26, until birth / day 62–64 ; **4** 610–630 µmol per g at, peak / AW / birth ; **5** steep decrease in glycogen, after birth / after day 62–64 / to 330–350 µmol per g / to day 69–71 ; **6** glycogen starts to increase (slowly), after day 70–73 / 7–10 days after birth ; **7** insulin is linked to increase in glycogen ; **8** glucagon is linked to decrease in glycogen ; **9** *idea of* changes in glycogen is linked to control of (blood) glucose concentration ; **10** homeostasis / negative feedback (in context of Fig. 4.1 / blood glucose) ; **11** AVP ;	**6**	units must be stated at least once **A** 420 µmol per g increase at birth (from start)
4(d)	not all mothers can produce enough milk ; some drugs can pass through into milk ; transfer of named pathogens in correct context ; painful nipples ; time consuming ; only mother can produce milk / fathers can't express milk ; infant not, suckling / has difficulties, so not enough intake / AW ; tiring ; AVP ;	**3**	

Question	Answer	Marks	Guidance
5(a)	dry / AW ;	**1**	
5(b)(i)	discontinuous ;	**1**	

Question	Answer	Marks	Guidance
5(b)(ii)	limited number of phenotypes / three categories **;** no intermediates / discrete / separate categories / AW **;** caused by genes only **;** bar chart (has gaps) **;**	**2**	
5(c)	thickness / length / width / mass / concentration of pigment / volume / surface area, of any leaf feature / density of stomata / number of, veins / chloroplasts / spikes **;;**	**2**	**A** concentration for density
5(d)	measured different leaves **;** change in (named) environmental (feature) **;** adapted to environment **;** leaves / plant, have, grown / older **;** AVP **;**	**1**	**A** mutation

Question	Answer	Marks	Guidance
6(a)(i)	diffusion ;	**1**	
6(a)(ii)	blood (in capillaries / **A**) is under (high) pressure ; (liquid) forced out (of capillaries / **A**) ; *ref. to* thin walls / pores / holes, in capillary (walls / bed) ; *ref. to* osmosis (through capillary walls / membranes) ; to form tissue fluid (in **B** / outside of cells) ;	**2**	
6(a)(iii)	red blood cells ; (large / named) proteins ; platelets ; AVP ;	**1**	
6(b)(i)	(semi-lunar) valves ; large, lumen / AW ; thin(ner) walls (than arteries) ; (thin) elastic, tissue / layer / wall ; (thin) muscle, tissue / layer / wall ; AVP ;	**2**	
6(b)(ii)	transports lymph ; transports, named component of lymph ; (lymphatic vessel) absorbs excess (tissue) fluid (from **B**) ; returns fluid to, blood / circulatory system ; AVP ;	**2**	
6(c)	*location*: in villi / small intestine ; *function:* absorbs / transports, fats / fatty acids ;	**2**	
6(d)(i)	lymph node ;	**1**	

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Question	Answer	Marks	Guidance
6(d)(ii)	(lymphocytes) provide (active) immunity **;** produce antibodies **;** (antibodies) lock-on to antigens **;** (antibodies mark) pathogen / antigen, for destruction / AW **;** (lymphocytes) produce memory cells **;**	**2**	**A** protect against, infection / pathogen **A** *ref. to* specificity **A** kill pathogen **A** ref. to long-term immunity

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