Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/42**

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
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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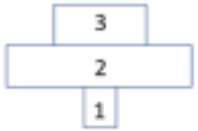
Question	Answer	Marks	Guidance
1(a)(i)	**A** dentine **B** cement **C** incisors **D** canine(s) **E** premolars **F** molars ;;;	**3**	6 / 5 correct = 3 marks 3 / 4 = 2 marks 1 / 2 = 1 mark
1(a)(ii)	mechanical ;	**1**	
1(b)(i)	acid ;	**1**	**A** carbon dioxide
1(b)(ii)	enamel ; dentine ;	**2**	
1(c)	(named) sugar ;	**1**	

Question	Answer	Marks	Guidance
2(a)(i)	the probability of an organism will surviving and reproducing (in the environment in which it is found) / AW ;	**1**	
2(a)(ii)	*aerial roots* for anchorage / stability (in flowing water) / (aerobic) respiration / gas exchange / oxygen absorption ; *floating seeds* for (seed) dispersal (carried on water) / reduce competition (from parent) / access to oxygen (to germinate / respire) ;	**2**	
2(b)(i)	1.1 (g) ;;	**2**	one mark for correct working if answer wrong (8000 / 7 500000) · 1000

Question	Answer	Marks	Guidance
2(b)(ii)	bottom bar is narrowest ; middle bar is widest ; correct numbering of trophic levels ;	**3**	
2(b)(iii)	pyramid of biomass is pyramid-shaped (and pyramid of numbers is not) ; **ora** mangrove trees have a larger biomass (than crabs) ; **ora** so one tree provides food for many crabs / AW ; (one) crab has a smaller biomass than (one) seagull ; **ora** each seagull needs to eat many crabs / AW ; (total) crab biomass is greater than (total) seagull biomass ; **ora** comparative data to support an argument with units ;	**4**	

Question	Answer	Marks	Guidance
3(a)(i)	sucrose / sugar ; amino acids ;	**2**	
3(a)(ii)	translocation ; (phloem) allows bidirectional movement / AW ; movement (of food / sap) from source to sink ; sucrose / amino acids / food, are produced / taken from storage, at a source ; region of respiration / storage / growth, is a sink ; named example of a, source / sink (in the correct context) ; some organs can be both a source or a sink at different times ;	**4**	

Question	Answer	Marks	Guidance
3(b)	*functions* conduct / transport, water (and mineral ions) **;** *ref to* transpiration **;** reduced resistance to water flow / AW **;** structural) support (for plant) **;** prevents (inward) collapse (of xylem vessels) **;** (spirals) allows (some) flexibility / bending, of stems (to prevent breaking) **;** *adaptations* long / elongated (cells / vessels / tubes) **;** *ref to* lignin (in walls) **;** (cell walls) are water impermeable / waterproof / AW **;** (secondary) thickening of cell walls **;** hollow / no cytoplasm / no (named) organelles **;** no, end / cross, walls (between cells) **;** end plates to connect vessels (end to end) **;** pits in walls (for water movement between vessels) **;**	**6**	max 5 from one section **A** rings / spirals / AW
3(c)	reduced / no, damage to crops **; ora** increased, yield / quality (of the crop) **; ora** more, income / profit **; ora** because more, sugar / amino acids, available for growth **; ora** reduced disease transmission / AW **; ora**	**2**	**A** not / less, eaten by pests

Question	Answer	Marks	Guidance
4(a)	there are many, diseases / infections / pathogens / transmitted through sexual contact **;** named example of STI **;** STIs / AW, can be prevented by the use of some (contraceptive) methods **;** such as, condoms / femidoms **;** for education about STI prevention / inform preventative strategies / AW **;** assess effectiveness of different (contraceptive) methods (to prevent disease) **;**	**3**	
4(b)(i)	(named) oestrogen **;** (named) progesterone **;**	**2**	
4(b)(ii)	(FSH would) stimulate an egg / follicle, to mature / develop / grow / ripen **; ora** (FSH would) stimulate (release of) oestrogen / LH **; ora** (FSH would) lead to ovulation **; ora** (FSH would) increase the chance of fertilisation / pregnancy / AW **; ora**	**3**	**I** production (of eggs) **A** FSH is a fertility drug
4(b)(iii)	implant / patch / injection / IUD / IUS (containing contraceptive hormones) **;** spermicide **;**	**1**	**I** birth control pills
4(b)(iv)	abstinence / body temperature / cervical mucus / natural contraception **;;** diaphragm **;** (named) surgical (sterilisation) method **;;**	**2**	**I** birth control pills **A** cap **A** (named) tubes tied
4(b)(v)	some females could use more than one method of contraception **;** some people may not have completed the survey, correctly / honestly / AW **;**	**1**	 **A** not used a method regularly (so not answered all questions accurately)

Question	Answer	Marks	Guidance
5(a)	three pairs of legs ; three (named) body segments ; wings ; (pair of) antennae ; compound eyes ;	3	
5(b)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) ;;	2	one mark for correct symbols one mark for correct balancing
5(c)(i)	volume ; distance / length ; control / maintain / regulate / stabilise / keep / constant / sustain ;	3	
5(c)(ii)	carbon dioxide will affect, results / volume of gas (in respirometer) / carbon dioxide could kill the larvae ;	1	**A** to measure (changes in) oxygen only
5(c)(iii)	growth / development ; active transport ; protein synthesis ; cell division / mitosis ; passage of nerve impulses ; muscle contraction ; AVP ; e.g. metabolism / (description of) metamorphosis	2	**A** movement / breathe / egestion /digestion / excretion

Question	Answer	Marks	Guidance
5(d)	*prediction* as temperature increases the respiration rate will increase **; ora** and then decrease **;** *explanation:* there will be an optimum temperature (at a particular temperature) for seed germination **;** *ref to* (respiratory / germination) enzymes **;** at high temperatures enzymes denature / described **;** at low temperatures not enough (kinetic) energy for, effective collisions / biochemical reactions / respiration / digestion **; ora** AVP **;**	**4**	 max 3 for explanation e.g. temperature will also affect the gas pressure in the respirometer

Question	Answer	Marks	Guidance
6(a)	(asexual) reproduction **;**	**1**	**R** sexual reproduction
6(b)(i)	image size ÷ magnification **;**	**1**	
6(b)(ii)	0.8 (μm) **;**	**1**	
6(c)(i)	(Type 1) diabetes **;**	**1**	**A** Type 2 diabetes
6(c)(ii)	*ref.* to (human) gene / DNA that codes for (human) protein **;** (human) DNA / gene, is, identified / isolated **;** DNA / gene / plasmid, cut (out) using restriction enzymes **;** forming, complementary / sticky, ends **;** DNA / gene / plasmid, cut with the same restriction enzymes **;** formation of recombinant, DNA / plasmid **;** into plasmid (DNA) ligase used to join plasmid and, gene / DNA **;** plasmids (with gene) inserted into bacteria **;** bacteria (with the plasmid), replicate / reproduce / multiply **;** AVP **;** e.g. purification / identification of transformed bacteria /	**5**	*procedures must be in the correct sequence*

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Question	Answer	Marks	Guidance
6(d)(i)	kills (named) microorganisms / pathogens ; prevents contamination (by bacteria / microorganisms) ; steam does not contaminant, product / medicines (with chemicals) ; steam reaches all the crevices of fermenter ;	**2**	
6(d)(ii)	pH ; temperature ; oxygen ; carbon dioxide ; (named) nutrients ; waste ; turbidity ; AVP ; (gas) pressure / rate of stirring / amount of (named) product	**3**	
6(d)(iii)	penicillin ; AVP ;	**1**	
6(e)	disease resistance ; large(r) / fast(er), yield ; drought resistance ; salt resistance ; frost resistance ; (named) nutritional enrichment ; pest / insect, resistance ; herbicide resistance ; vaccine production ; *ref to* benefits to, environment ; *ref to* more desirable, product / increased income / AW ; *ref to a* qualified benefit to humans ; e.g. food shortage / described health benefit AVP ; growth modification e.g. short stems / adaptations to extreme environments / rapid improvement to crop / improvements using characteristic that are not present in natural population	**4**	

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