Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/41**

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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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)	(group of) organisms that can reproduce ; to produce fertile offspring ;	**2**	
1(b)	pinna(e) / external ears ; mammary glands / milk glands / production of milk / lactating / suckling / breast feeding / nipples / AW ; diaphragm ; (three) bones in the middle ear ; (four) different types of teeth / two sets of teeth ; sweat glands ; enucleated red blood cells ; uterus / placenta / navel / AW ; AVP ;	**2**	
1(c)	select, parent(s) / sheep / AW, with, fine / thin, hairs (in wool) OR use Merino sheep from South Africa and NZ sheep ; cross them together / use artificial insemination / IVF / AW ; measure / AW, the hairs in the wool of all the offspring ; select offspring with, fine / thin, hairs (in wool) ; cross / AW, offspring together ; continue / repeat, selection and/or breeding ; over many generations ; AVP ;	**5**	max 4 if no reference to quality of wool
1(d)	features are, adaptive / adaptations (for environment) ; caused by / AW, the, environment / surroundings ; competition between individuals for (named) resource(s) ; reference to named selective agent(s) ; slow(er) ; increase in fitness ; explained: ability to survive AND reproduce (in natural environment) ; maintains (genetic) variation / less (genetic) variation in selective breeding ; random mating ;	**3**	

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Question	Answer	Marks	Guidance
2(a)	carbon dioxide is, raw material / substrate / reactant / AW ; concentration of carbon dioxide is higher outside leaf than inside (so carbon dioxide diffuses into the leaf) ;	**2**	
2(b)	subtract the concentration of carbon dioxide at the end from the concentration at the start / AW ; divide by the time (taken) / per unit time ; ref. to taking (rate of) respiration into account ;	**2**	
2(c)(i)	light intensity ; water (supply) ; humidity ;	**1**	
2(c)(ii)	increases and, reaches a plateau / remains constant / 'levels off' ; increases (between 10 °C) to 30 °C / levels off at 30 °C ; any comparative use of figures for rate with units at least once ;	**3**	
2(c)(iii)	36 ;;	**2**	

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Question	Answer	Marks	Guidance
2(c)(iv)	temperature is the limiting factor (over whole range) **;** increased temperature increases, kinetic energy / KE, (of molecules) **;** increases rate of diffusion of carbon dioxide (into leaf) **;** temperature, influences / affects, (activity of) enzymes **;** *idea of* more (effective) collisions between substrate molecules and enzymes (in plant) / more enzyme-substrate complexes formed **;** more carbon dioxide is, fixed / used in photosynthesis / converted into sugar / AW **;** carbon dioxide (concentration) is **not** limiting **;**	**3**	
2(c)(v)	***B*** *shows that:* rate of photosynthesis is, higher / continues to increase, if carbon dioxide is increased (at all temperatures / AW) **;**	**1**	
2(d)	*prediction:* rate of photosynthesis, remains constant / decreases / slows **;** *any explanation one from:* enzymes / active sites, are denatured (at high temperatures) **;** stomata close, so, little / no, carbon dioxide can enter leaves **;** plant is adapted to survive at high temperatures **;**	**2**	

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Question	Answer	Marks	Guidance
3(a)	accommodation ; antagonistic ; peripheral ; optic ; brain ;	**5**	
3(b)	involves, proteins / carriers / pumps (in neurone membrane) ; (named) ion(s) bind to, proteins / carriers / pumps, to move ions / AW ; move ions, against concentration gradient / from low to high concentration ; using energy ; AVP ; e.g. change in shape of carrier (protein)	**3**	

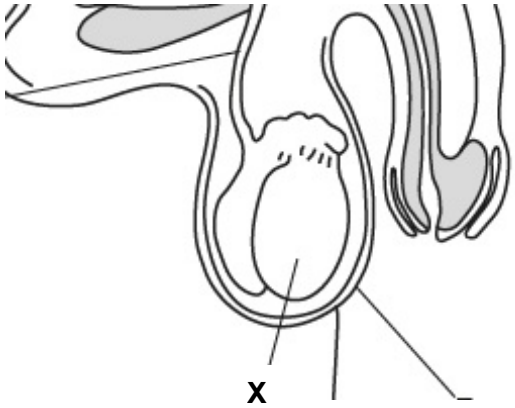
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Question	Answer	Marks	Guidance
3(c)	*general marking point* neurotransmitters move across, synapse / gap / junction / AW **;** *atropine* neurotransmitter cannot, bind to / enter / reach, receptors **;** therefore no impulses (along, next / postsynaptic, neurone) / no impulses reach the CNS **;** no sensitivity to stimuli / feels no pain / painkiller **;** no, contraction of muscle / response **;** depressant **;** *eserine* neurotransmitter stays in, synapse / synaptic gap **;** neurotransmitter can bind to receptor (rather than stay in synapse) **;** continuously stimulates the, next / postsynaptic, neurone **;** (more) impulses are sent (in, next / postsynaptic, neurone) **;** repeated, contraction of muscle / response **;** stimulant **;**	**6**	**A** reaction time is longer / no reflex

Question	Answer	Marks	Guidance
3(d)	anabolic steroids increase, muscle mass / AW ; gives athletes unfair advantage / ref. to cheating / unethical / immoral ; (named), side effect / effect on health ; can be banned from taking part in sport if found using them ; ref. to illegality ; AVP ; e.g. can lose sponsorship / loss of reputation / AW	**3**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4(a)</td><td>tissue ;
cell structure ;
cell ;
organ ;</td><td>4</td><td></td></tr>
<tr><td>4(b)</td><td>
<table>
<tr><th>name of structure</th><th>function</th><th>letter on Fig. 4.1</th></tr>
<tr><td>testis</td><td>production of sperm / produces or releases testosterone</td><td>C ;</td></tr>
<tr><td>sperm duct</td><td>transports sperm but not urine</td><td>D ;</td></tr>
<tr><td><u>urethra</u></td><td>passage for urine and seminal fluid through the penis</td><td>A ;</td></tr>
<tr><td>prostate gland</td><td>secretes / produces, seminal fluid / nutrient-rich fluid / alkaline fluid / AW</td><td>E ;</td></tr>
<tr><td>scrotum / scrotal sac</td><td>contains testes</td><td>B ;</td></tr>
</table>
</td><td>5</td><td>one mark per row</td></tr>
</table>

Question	Answer	Marks	Guidance
4(c)	**X** on testis / label line on testis with X ;  	1	
4(d)(i)	one set of chromosomes ;	1	
4(d)(ii)	23 ;	1	

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Question	Answer	Marks	Guidance
5(a)(i)	liquid / fluid / watery, part of blood ;	1	
5(a)(ii)	amino acid(s) ;	1	
5(b)(i)	plasmid ;	1	
5(b)(ii)	restriction (enzyme) ;	1	
5(b)(iii)	cutting / opening, **A /** the plasmid, with same (restriction) enzyme(s) ; forming, sticky ends ; *idea that* (sticky) ends of human DNA and plasmid DNA are complementary ; reference to, bases / base sequences (of sticky ends) ; correct reference to (DNA) ligase ; e.g. inserting gene / sticky ends joining / splicing AVP ; e.g. **B** is a recombinant (plasmid / DNA)	3	
5(b)(iv)	reliable / constant, supply ; produce, large(er) quantities / in a fermenter / bacteria reproduce quickly (to make more genetically engineered bacteria) ; not dependent on blood donations ; idea that no (named) health risk(s) ; higher quality of product ; AVP ;	1	
5(b)(v)	mRNA moves through the cytoplasm ; mRNA molecules, move to / through, ribosomes ; sequence of bases in mRNA determines order of amino acids (in TPA) ; for protein synthesis / to make proteins ; AVP ;	2	
6(a)(i)	cell wall ; cells are a regular shape / described ; vacuole(s) ; AVP ;	1	

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Question	Answer	Marks	Guidance
6(a)(ii)	growth **;** producing cells **;** increase length of shoot / elongation of shoot **;**	**1**	
6(b)	dividing cell / cell division / mitosis, needs (lot of) energy **;** carry out aerobic respiration **;** provide / release, energy **;** (for) a named function in dividing cells **;** e.g. movement of chromosomes making cell wall making new (named) molecules (e.g. protein / DNA) making (named) organelle(s)	**3**	

Question	Answer	Marks	Guidance
6(c)(i)	auxin **;**	**1**	
6(c)(ii)	*auxin / hormone:* made in the, shoot / stem, tip **;** moves away from the tip **;** moves to / collects on, lower side of stem **;** stimulates cell elongation **;** stem, bends / grows, upwards **;** AVP **;**	**4**	
6(d)	plants have different, structures / parts / specialised cells **;** *idea that* different parts / specialised cells, have different, functions / roles / features **;** *idea that* specific proteins are required in, parts / specialised cells **;** genes code for proteins **;** therefore some genes, are required / are not required **;** AVP **;** e.g. *idea that* waste of (named) resource(s) if all genes expressed	**3**	

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