Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/42**

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

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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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Question	Answer	Marks	Guidance
1(a)(i)	exoskeleton / AW **;** jointed / segmented, limbs / legs / appendages / AW **;** pairs of, limbs / legs / appendages / AW **;** segmented (body) / AW **;** bilateral body symmetry **;**	**2**	
1(a)(ii)	**Box 2**: *any one from:* animal has, 3 pairs of legs / 6 legs / less 4 pairs of legs / less than 8 legs **;** wings **;** head, thorax, abdomen / body in three sections **;** no, pincers / claws / carapace **;** **Box 3**: *any one from:* (animal has) claws / pincers, of different sizes / AW **;** eyes on stalks **;** smooth, carapace / body / 'shell' **;** body, has five sides / is angular **;** hairs / bristles / AW, on, legs / claws **;**	**2**	
1(b)(i)	4 pairs of legs / 8 legs **;** fused head and thorax / cephalothorax / two sections *or* parts of the body **;** (pedi)palps **/** described **;** AVP **;**	**1**	
1(b)(ii)	inherited feature / controlled by gene(s) / allele(s) / DNA **;** functional / AW, feature **;** increase, fitness / chances of survival **;** increases chance of reproducing (to leave offspring) **;** any suitable example visible in *T. grallator* **;** e.g. camouflage / warning signal / scares predators / lure for prey / sexual attractant	**3**	

Question	Answer	Marks	Guidance
1(c)	*identification can be done using:* base, sequences / order / pattern, in DNA / genes ; each species, has unique / AW, DNA / genes ; *idea that* compare with, reference DNA / base sequences / genes, of known species ; *idea that* if a match with DNA from known species then DNA is from that species OR closely related species have fewer differences in their, base sequences / DNA / genes ; AVP ; e.g. any technique involved in DNA analysis	**2**	
1(d)	hunting / collecting / AW ; pollution ; pesticide(s) / insecticide / (chemical) spray(s) that kill animals / poisons ; loss of habitat / any example ; disease ; increased competition / described ; increase in predator(s) ; climate change / any example ; lack of food / loss of prey species ; AVP ;	**3**	
2(a)	any shape drawn that includes one whole vascular bundle including all of the xylem and phloem with or without sclerenchyma ; label line from **X** to xylem in any of the vascular bundles ;	**2**	
2(b)	cell vacuoles / cells, contain (much) water / have high water potential ; water absorbed, by osmosis / down water potential gradient ; cells, are turgid / have a turgor pressure ; cell contents / vacuole / cell membrane, pushes out (against cell wall) ; cell wall, does not stretch / is inelastic / is rigid ; AVP ; e.g. cells are tightly packed / AW	**3**	

Question	Answer	Marks	Guidance
2(c)	**Q** sucrose / ^{13}C, is in shoot <u>and</u> root ; **T** no, sucrose / ^{13}C, in shoot or root ; **R** sucrose / ^{13}C, in root only / (in root but) not in shoot ; **S** sucrose / ^{13}C, in shoot only / (in shoot but) not in root ; *idea that* no transport of, sucrose / ^{13}C, where phloem is removed ; phloem transports (sucrose) in both directions ; leaf is source / carbon (dioxide) is fixed in leaf / sucrose is made in leaf ; roots / shoots, are sink(s) / described ; e.g. of descriptions respired / stored as starch / converted to another (named) compound ; AVP ; e.g. **Q** is a control	**5**	
3(a)(i)	provides, suitable / optimum, pH for (correct named) enzyme action ; activates, enzyme / pepsin ; kills / AW, bacteria / viruses / pathogens / microbes ; AVP ;	**2**	
3(a)(ii)	(catalyses) breaks down / (chemically) digests, of protein ; to amino acids ;	**2**	
3(b)	movement of digested food molecules <u>into cells</u> ; food molecules become part of cells ;	**2**	
3(c)	(stem cells) divide by <u>mitosis</u> ; form (named) specialised cells (in stomach) ; to replace cells (in the lining of stomach) ; *idea that* cells are worn away from the surface of the stomach ; for repair of any damage to tissues ;	**2**	
3(d)	increase / large, (surface) area ; for absorption (of named substances) / described; AVP ;	**2**	

Question	Answer	Marks	Guidance
3(e)	54(%) ;;;	**3**	one mark for correct readings (78 minutes and 120 minutes) one mark for correct calculation one mark for whole number correctly rounded
4(a)	ref. to, mechanical / chemical, barriers ; nasal hairs, trap / filter / AW, pathogens ; mucus traps pathogens / pathogens stick to mucus ; mucus, produced / secreted, by goblet cells ; cilia move mucus (upwards / towards mouth / away from alveoli) ; coughing / sneezing / swallowing ; phagocytes / phagocytosis / described ;	**4**	
4(b)	introduces harmless form of pathogen / AW ; ref. to antigen(s) ; stimulates an <u>immune response</u> ; ref to <u>active immunity</u> ; <u>lymphocytes</u> produce antibodies ; (lymphocytes develop into) memory cells ; memory cells, remain in the body / give long-term immunity / can produce antibodies (at a later time) ; respond quickly when an infection (of the same pathogen) occurs / before symptoms occur ; AVP ;	**4**	
4(c)	*idea that* viruses have no antibiotic targets ; viruses, are not alive / are not living / cannot be killed / not cells ; no cell membrane ; no cell wall ; no protein synthesis / no ribosomes ; no metabolism / do not respire ; AVP ; e.g. viruses are inside (host) cells	**2**	

Question	Answer	Marks	Guidance
4(d)(i)	percentage of males smoking increases faster than females **; ora** more men smoked than women / higher percentage of men smoked (over all the time) **; ora** peak for percentage of men smoking occurred earlier **; ora** decrease in percentage of men smoking is greater than in females **; ora** difference between percentages smoking decreases after peaks **;** any comparative use of percentages **;**	**3**	

Question	Answer	Marks	Guidance
4(d)(ii)	***for from* A** percentage of men and women that smoke increases **and** decreases **;** numbers of deaths from lung cancer in both groups increases **and** decreases **;** both show lag between peak smoking and peak deaths from lung cancer **;** country A shows, same time gap / 40-year gap, between peaks for smoking and deaths from smoking **;** ***for from* B** percentage of men and women who smoke has decreased (overall) **;** numbers of deaths from lung cancer in both groups increase **;** ***against from* B** percentage female smokers, fluctuates / AW, but no fluctuation in men **;** numbers of deaths in men increase (continually), whereas deaths in females does not **;** country **B** may show the same but no data to be sure / no data from before 1950 **;** any data quote - percentage / number **and** approximate year and units **;**	**6**	

Question	Answer	Marks	Guidance
5(a)(i)	anthers / stamens / filaments / stigma, hang / AW, outside (the flower) **;** large, anthers / **C**, produce large quantities of pollen **;** *idea that* anthers / **C**, easily release pollen **;** 'feathery' / AW, stigma / **B** **;** stigma has, feathery surface / large surface area, to catch pollen **;** bracts / **A**, are, small / inconspicuous **;**	**3**	**A** petals
5(a)(ii)	**C** **;**	**1**	
5(b)	*idea that* pollination / fertilisation, always going to happen / AW **;** no agent of pollination needed **;** little wastage of pollen **;** reduced / little, variation / diversity **;** increased competition between plants (as have the same adaptation) **;** increase chance of, genetic / inherited, disease **;** all plants adapted to same, conditions / environment **;** little ability to adapt to changing conditions / little ability to evolve **;** an infectious disease can kill all of the population / all plants more susceptible to the same disease **;** risk of extinction **;** AVP **;**	**4**	

Question	Answer	Marks	Guidance
5(c)	drought / lack of rain / lack of (irrigation) water ; flooding ; fire ; tsunamis / cyclones / hurricanes ; earthquakes / volcanic eruptions ; plagues of, animals / insect pests ; pests / diseases, of stored food / livestock ; conflict / war ; rising prices of food ; poverty ; unequal distribution of food ; growing, non-food crops / biomass for fuels / crops for export ; increase in population / migration of people ; soil degradation / soil erosion / desertification / salination of soils / loss of soil fertility / barren land / AW ;	**3**	
5(d)(i)	expose the plants to (stem), rust / fungus ; find out if plants have DNA for rust resistance ; only use those plants that show no symptoms / AW ;	**2**	
5(d)(ii)	to increase the, numbers of plants / population ; incorporate more genes from the high yield variety ; to maximise the yield of wheat from individual plants ; check that the plants keep their resistance to rust ; check the plants grow well in field conditions ; make sure the plants are, pure-breeding / homozygous ;	**1**	
5(e)	*one from:* one, cotyledon / embryonic leaf / seed leaf oblong leaves / narrow leaves / straight leaves parallel-veined leaves / straight veins (named) flower parts in multiples of three fibrous roots / adventitious roots scattered vascular bundles in stem AVP ;	**1**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6(a)</td><td><table><tr><th>letter on Fig. 6.1</th><th>name of the process in the carbon cycle</th></tr><tr><td>A</td><td>photosynthesis ;</td></tr><tr><td>B</td><td>combustion ;</td></tr><tr><td>C</td><td>respiration ;</td></tr><tr><td>D</td><td>fossilisation ;</td></tr></table></td><td>4</td><td></td></tr>
<tr><td>6(b)</td><td>gap 1: heat OR long-wave / infra-red, radiation ;

gaps 2 and 3, any two from: ;;
paddy fields / rice farming
(named) animals / livestock
decay / decomposition (by bacteria)
rubbish tips / landfill
sewage / dung / faeces
(natural) gas extraction / fracking
melting tundra
waterlogged soil / swamp / marsh
biomass burning / forest fires / peat fires

gap 4: enhanced ;
gap 5: sulfur dioxide / sulfur trioxide / nitrogen oxide(s) ;
gap 6: non-biodegradable / micro- / non-recyclable / single-use ;</td><td>6</td><td></td></tr>
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