Cambridge Assessment International Education

Cambridge IGCSE™

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **October/November 2020**

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 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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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.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	'List rule' guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

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6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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Question	Answer	Marks	Guidance
1(a)(i)	(the ability to) detect stimuli (in the internal / external environment) ; to make (appropriate) responses ;	**2**	
1(a)(ii)	groups of receptor cells ; responding to specific stimuli ;	**2**	
1(b)(i)	fovea ;	**1**	
1(b)(ii)	lens drawn with correct shape and position ; light rays are shown refracted in, cornea / lens ; light rays focused on fovea ;	**3**	
1(b)(iii)	(ciliary) muscles relax ; suspensory ligaments are, taut / tight / tense / are pulled / AW ; so ligaments pull on lens ; lens is, thin(ner) / flatter / less convex / elliptical shape / stretched ; light is refracted less ;	**3**	
1(c)	*idea that* size of pupil, decreases / constricts / gets smaller ; iris in the correct context ; circular muscles (of iris) contract ; radial muscles (of iris) relax ; ref to antagonistic muscles ;	**3**	
1(d)	reflex / involuntary ;	**1**	

Question	Answer	Marks	Guidance
2(a)	**A** enamel ; **B** dentine ; **C** pulp / pulp cavity / nerve / sensory neurone / capillaries / blood vessels ; **D** gum ;	**4**	

Question	Answer	Marks	Guidance
2(b)	mechanical / physical, digestion ; crushes food / chewing / grinds food / breaks food into smaller pieces ; increases surface area of food ; for (named) enzyme action / chemical digestion ; AVP ; e.g. mix food with saliva	**3**	
2(c)	(named) food remains on teeth ; bacteria, use / breakdown, sugars / carbohydrate / sweet foods ; respiration ; acid is produced ; acid, dissolves / erodes / destroys / wears away / AW, enamel ; dentine is exposed / AW ; dentine, softer / dissolves more rapidly (than enamel) ; AVP ; e.g. decay reaches nerve endings leading to pain	**4**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3(a)</td><td>
<table>
<tr><th>trophic level</th><th>description</th><th>example from Fig. 3.1</th></tr>
<tr><td>herbivore</td><td>feeds on, (named parts of) plants / producers / / autotrophs</td><td>collared peccary / lowland tapir / red harvester ants / termites ;</td></tr>
<tr><td>producer</td><td>makes own food / photosynthesis / autotrophic</td><td>muhly grass / Peruvian feather grass ;</td></tr>
<tr><td>quaternary / 4° / fourth / 4th, consumer</td><td>feeds on tertiary consumers</td><td>great horned owl ;</td></tr>
<tr><td>secondary consumer</td><td>gets energy from / feeds on, primary consumers / herbivores</td><td>long-tailed weasel / bobcat / jaguar / nine-banded armadillo / hooded skunk ;</td></tr>
</table>
</td><td>4</td><td>one mark per correct row</td></tr>
<tr><td>3(b)(i)</td><td>(named) decomposers ;</td><td>1</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
3(b)(ii)	**1** *idea that* small percentage of energy from sun is 'fixed' by photosynthesis **;** **2** most energy from sun not available / reference to wrong wavelength / AW **;** **3** energy is lost, between / within, trophic levels / along food chain **;** **4** ref. to 10% energy transfer / ORA **;** **5** ref. to material that is, inedible / not digestible / egested / not absorbed / not consumed **;** **6** energy lost, in respiration / heat / movement / (named) metabolic process **;** **7** ref. to energy loss to (named) decomposers **;** **8** ref. to (small) total percentage reaching fourth trophic level **;** ***or*** not enough energy (in fourth trophic level) to support, 5th / another, level **;** **9** would be very small population of predators in fifth trophic level / (population of) predators in fifth trophic level unlikely to survive **;** **10** fifth trophic level may be parasites which are very small **;**	**4**	
3(c)(i)	**1** effect of waste (faeces and urine) on, waterways / crops **;** **2** disease spreading to, wild populations / humans **;** **3** use of antibiotics and (spread of) antibiotic resistance **;** **4** use of pesticides **;** **5** loss of <u>biodiversity</u> **;** **6** release of, (named) greenhouse gases / carbon emissions **;** **7** named consequence **;** e.g. climate change / global warming **8** providing food for livestock requires monocultures **;** **9** deforestation / habitat loss **;** **10** *idea that* livestock production is an inefficient use of, crop plants / energy **;** **11** AVP **;** e.g. use of hormones and effect on wild populations / feminisation of fish	**3**	

Question	Answer	Marks	Guidance
3(c)(ii)	**1** silting of rivers ; **2** landslides / mudslides ; **3** soil does not absorb (rain)water / increased risk of flooding ; **4** increased rate of evaporation / land is exposed to drying ; **5** desertification / decreased soil water ; **6** reduction in transpiration ; **7** reduction in cloud formation ; **8** change in rainfall patterns ; **9** plants cannot grow (well) ; **10** *idea that* loss of anchorage for plants ; **11** *idea of* reduced (soil) fertility / increased leaching / AW ; **12** loss of, habitat / places where organisms live / described ; **13** disruption to food chain(s) / described ; **14** endangered / extinction / migration of, species ; **15** less, nutrient / nitrogen / carbon, recycling ; **16** AVP ; e.g. dust storms	**3**	

Question	Answer	Marks	Guidance
4(a)(i)	**A** (rough) endoplasmic reticulum ; **D** (sap) vacuole ;	**2**	**A** ribosomes
4(a)(ii)	**B** */ nucleus – one from:* store of, DNA / chromosomes / genetic information / genetic material / genes ; controls / regulates, (reactions / protein synthesis in) the cell ; **C** */ mitochondrion – one from:* (aerobic) respiration ; releases / provides, energy ;	**2**	
4(a)(iii)	chloroplast ;	**1**	**A** starch grain
4(b)(i)	**S** – amylase ; **T** – maltase ;	**2**	

Question	Answer	Marks	Guidance
4(b)(ii)	$C_6H_{12}O_6$; 2 (C_2H_5OH) + 2CO_2 ;	**2**	
4(b)(iii)	**1** conserves fossil fuels ; **2** *idea that* fossil fuels are a finite resource / fossil fuels are not renewable / biofuels are renewable ; **3** maize / plants, uses carbon dioxide (from the atmosphere) ; **4** ref to photosynthesis ; **5** *idea that* so balancing the carbon dioxide in, exhausts / emissions / AW ; **6** less likely to cause acid rain ; **7** ref to global warming / climate change / (enhanced) greenhouse effect ; **8** uses waste from crops for energy ; **9** AVP ; e.g. reduces dependency on fossil fuels from other countries	**3**	
4(b)(iv)	**1** carbon dioxide is required for photosynthesis ; **2** (more carbon dioxide =) faster / maximum / optimum, rate of photosynthesis ; **3** (more carbon dioxide) more, glucose / starch / organic molecules, is produced ; **4** carbon dioxide (concentration) is a limiting factor ; **ora** **5** prevents concentration falling below that of atmosphere / AW ; **6** ref. to more, growth / yield / profit ;	**4**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5(a)</td><td>
<table>
<tr><th>hormone</th><th>site of production</th><th>target organ</th><th>role</th></tr>
<tr><td>FSH</td><td>pituitary gland</td><td>ovary</td><td>(stimulates) development of egg or ovum / ref. to secretion of oestrogen ;</td></tr>
<tr><td>LH</td><td>pituitary gland</td><td>ovary</td><td>(stimulates) ovulation / ref. to secretion of progesterone (and oestrogen) ;</td></tr>
<tr><td>oestrogen</td><td>ovary ;
A placenta</td><td>uterus</td><td>stimulates growth of the lining of the uterus</td></tr>
<tr><td>progesterone</td><td>ovary ;
A placenta</td><td>uterus</td><td>maintains / AW, the lining of the uterus ;</td></tr>
</table>
</td><td>5</td><td></td></tr>
<tr><td>5(b)</td><td>days 0–7:
decrease in thickness ;
decreases quickest between days 0 and 3 ;

days 7–28:
increase in thickness ;
remains at same thickness from day, 21 / 22 / 23 ;</td><td>3</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
5(c)		**6**	

	similarities		**differences A ora**
1	treatment with fertility drugs **;**	**10**	ovulation occurs in AI **;**
2	(fertility drugs) encourage, follicle production / egg development **;**	**11**	fertilisation in AI occurs inside the body / in IVF it occurs in, a Petri dish *or* outside the body *or* AW **;**
3	intercourse does not occur **;**	**12**	eggs removed (from ovary) in IVF **;**
4	collection of sperm (from a donor) **;**	**13**	embryo starts development outside body in IVF / embryo inserted into uterus in IVF **;**
5	washing of sperm **;**	**14**	excess / surplus, embryos produced in IVF **;**
6	fertilisation *or* fusion of, gametes / egg and sperm **;**	**15**	embryo selection possible in IVF **;**
7	lining of uterus must develop **;**	**16**	frozen / stored, embryos in IVF **;**
8	implantation occurs (naturally) **;**		
9	**A** *as* a *similarity or as a way IVF differs from AI* increase chances of multiple, births / babies **;**		

Question	Answer	Marks	Guidance
6(a)(i)	**T ;**	**1**	
6(a)(ii)	**C** and **G ;**	**1**	
6(b)	**1** store of, genetic information / genetic make-up / genes / AW **;** **2** DNA / genes / alleles / genetic information / base sequence, codes for / makes, (named) proteins **;** **3** sequence of <u>bases</u> in DNA codes for sequence of, amino acids **;** **4** transfer of information to daughter cells (during mitosis) **;** **5** DNA copied as mRNA **;** **6** AVP **;**	**2**	
6(c)(i)	each chromosome is, duplicated / replication / doubled / copied **;** to maintain the same number of chromosomes OR so all cells have the <u>same genetic information</u> / cells are all <u>genetically</u> <u>identical</u> **;**	**2**	
6(c)(ii)	cell membrane **;** cell wall **;** AVP **;**	**2**	
6(c)(iii)	(a diploid cell has) two sets of chromosomes **;**	**1**	

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