Cambridge Assessment International Education

Cambridge IGCSE™

BIOLOGY **0610/43**

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

MARK SCHEME

Maximum Mark: 40

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	<u>'List rule' guidance</u> 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.

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
- max indicates the maximum number of marks that can be awarded
- 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)	seedling **A** bending towards the light **;** seedling **B** with taller shoot than original (growing straight up) **;**	**2**	
1(b)(i)	the ability to detect stimuli, in the internal / external environment **;** to make appropriate, responses **;**	**2**	
1(b)(ii)	*any four from:* **1** auxin (is a plant hormone) **;** **2** auxin made in (root / shoot) tip (only) **;** **3** auxin, diffuses (through the plant) **;** **4** auxin, is unequally distributed / (more) auxin accumulates lower parts **;** **5** (auxin) stimulates cell elongation **;** **6** shoots, grow away from / against, gravity / negative (tropic) response OR roots, grow towards / with, gravity / positive (tropic) response **;** **7** AVP **;**	**4**	
1(b)(iii)	*any two from:* (roots / plants growing down) anchor the plant / AW **;** (roots / plants growing down are more likely) to reach, water / (named) minerals **;** (shoots / plants) growing up are more likely) to reach light **;** (shoot or plant has better) access to (named) pollinators **;**	**2**	
1(c)(i)	*any two from:* (reflexes) respond faster **; ora** (reflexes) use, (electrical) impulses / neurons / nerves / nervous system **;** (reflexes) are shorter lived **; ora** (reflexes) are not a growth response **; ora** AVP **;**	**2**	
1(c)(ii)	groups of receptor cells **;** responding to specific stimuli **;**	**2**	

Question	Answer	Marks	Guidance
2(a)	**R** **T** **S ;** **P** **Q ;**	**2**	one mark for **T** before **S** one mark for **P** before **Q**
2(b)(i)	*any two from:* nucleus **;** ribosomes **;** rough endoplasmic reticulum **;** vesicles **;** mitochondria **;** cell membrane **;** AVP **;**	**2**	

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Question	Answer	Marks	Guidance
2(b)(ii)	*component:* hydrochloric acid **;** *functions:* (acid) creates optimum pH for, (stomach) enzymes / pepsin / protease **;** (acid) kills (harmful) microorganisms / denatures enzymes (of microorganisms) **;** OR *component:* pepsin / protease **;** *functions:* protein → amino acids **;** ref. to chemical digestion (by enzymes) **or** to allow soluble molecules / amino acids, to be absorbed **;** pepsin digests, bacteria / pathogens **;** OR *component:* water **;** *functions:* acts as a solvent / AW **;** OR AVP **;;**	**3**	
2(b)(iii)	mucus **;**	**1**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2(c)(i)</td><td>(mix with) bile ;
breaks up of large fat globules (into smaller fat globules) ;
increases surface area (of fat globules) ;
AVP ; e.g. water enables dispersion of (smaller) fat globules</td><td>2</td><td></td></tr>
<tr><td>2(c)(ii)</td><td>small intestine / duodenum ;</td><td>1</td><td></td></tr>
<tr><td>2(c)(iii)</td><td>lacteal ;</td><td>1</td><td></td></tr>
<tr><td>3(a)(i)</td><td><table><tr><td>the number of different producers</td><td>2</td></tr><tr><td>the number of different secondary consumers</td><td>5 ;</td></tr><tr><td>the number of different trophic levels in the food web</td><td>4 ;</td></tr><tr><td>how many different trophic levels monkeys feed at</td><td>2 ;</td></tr></table></td><td>3</td><td></td></tr>
<tr><td>3(a)(ii)</td><td>fifth (trophic level) / (trophic level) 5 / quaternary consumer ;</td><td>1</td><td></td></tr>
<tr><td>3(a)(iii)</td><td>any three from:
1 fruit bats are at a lower trophic level (than anaconda) ; ora
2 idea that energy transfer along a food chain is inefficient ;
3,4 named examples of causes of inefficient energy flow between trophic levels ;;</td><td>3</td><td>e.g. respiration / egestion / uneaten parts / excretion / movement</td></tr>
<tr><td>3(b)(i)</td><td>any two from:
ref. to use of extracted DNA / protein (from tissue) ;
(determination of) DNA / base / amino acid, sequences ;
DNA / sequences / amino acids / genes, compared with, other (known) species / organisms / ancestors / DNA databases ;</td><td>2</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
3(b)(ii)	*any three from:* loss of habitat / described **;** addition of (named polluting) chemicals **;** human animal conflict **;** (the crop is often an) introduced species **;** loss of biodiversity **or** loss of, suitable / variety of, food sources **;** outbreaks / spreading, of diseases / pests / plagues **;** AVP **;**	**3**	
4(a)	conversion from μm to mm **;** calculation of volume (of each grid square) **;** calculation of final answer =13 000 (cell per mm^3) **;**	**3**	apply ecf from one step to the next MP1 e.g. (200 μm) = 0.2 (mm) MP2 e.g. $0.2 \times 0.2 \times 0.1 = 0.004$ (mm^3) MP3 e.g. 52 yeast cells × 25 grid squares gives a total of 1300 yeast cells in a volume of 0.1 mm^3 (which is the total volume of grid ($0.004 \times 25 = 0.1$ mm^3)) multiple 1300 by 10 to convert to yeast cells per mm^3
4(b)(i)	**X** on Fig. 4.3 on / near, solid line between 0 and up to 1 day **;**	**1**	
4(b)(ii)	line drawn on Fig 4.3, increasing from day 3, more slowly / level **;** line drawn on Fig 4.3 showing any decrease (in population) at end of candidate's line **;**	**2**	

Question	Answer	Marks	Guidance
4(b)(iii)	*any five from:* sugar concentration decreases faster between day 6 and 9 **; ora** no change in sugar concentration / stops decreasing, from day 9 **;** the yeast population affects the sugar concentration **;** (yeast use sugar) in respiration **;** release energy **;** rate of sugar decrease is slow, at first / in lag phase, because there are few yeast cells **; ora** ref. to dead yeast (after day 9) / death phase / AW **;** AVP **;** e.g. ethanol build up / change in pH, could kill the yeast / some sugar leftover so it is not a limiting factor	**5**	
4(c)	carbon dioxide (produced by respiration) **;** (gas) pressure will increase **/** AW **;**	**2**	

Question	Answer	Marks	Guidance
5(a)(i)	haploid ;	1	
5(a)(ii)	oviduct ;	1	
5(a)(iii)	*any four from:* ref. to acrosome / (digestive) enzymes, are released (from sperm) ; jelly coat is digested (by enzymes) ; fusion of nuclei (of gametes) / fertilisation ; to form a (diploid) zygote ; jelly coat hardens (after fertilization) ; zygote moves, along oviduct / towards uterus ; cell division / mitosis (after formation of zygote) ; AVP ; e.g. use of energy stores from egg cell (for mitosis)	4	

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Question	Answer	Marks	Guidance
5(b)	*any six from:* *use of fertility drugs:* **1** FSH / LH (are used in fertility treatment) **;** **2** taken / injected, during early stage of menstrual cycle **;** **3** (FSH) stimulates <u>follicles</u> to, develop / mature **;** **4** (fertility drugs) stimulate, the ovaries / production of oestrogen **;** **5** (LH / FSH) stimulates, ovulation / described **;** **6** AVP **;** *process of IVF:* **7** collect / extract, eggs **;** **8** collect / extract, sperm **;** **9** use of donor, eggs / sperm **;** **10** fertilisation / described / IVF, outside the body / in a dish / in a laboratory **;** **11** embryo development in dish **/** AW **;** **12** screening of embryos **;** **13** inserting embryos into uterus **;** **14** give mother progesterone after inserting embryos (to maintain lining) **;** **15** AVP **;** appropriate ref. to surrogate mothers **or** multiple embryos / zygotes, could lead to multiple births	**6**	
6(a)(i)	*insecticide:* **3 ;** *dosage:* 5 (mg per dm^3) **;** *explanation:* insecticide **3** has lowest dosage required to remove all insects species **;**	**3**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6(a)(ii)</td><td>any three from:

<table>
<tr><th>factor to consider</th><th>discussion points</th></tr>
<tr><td>1 toxicity (of the insecticide) ;</td><td rowspan="4">7 importance of (named) pollinators (in ecosystem) ;
8 potential creation of insecticide-resistant ‘super’ bugs ;
9 harms other (named) non-target species / damages food chains / pollutes environment / described ;</td></tr>
<tr><td>2 persistence (of insecticide) / how quickly it breaks down / biodegradable ;</td></tr>
<tr><td>3 presence of non-target species in the environment ;</td></tr>
<tr><td>4 prevailing environmental / climatic conditions ;</td><td rowspan="2">10 avoid spread into non-target areas ;</td></tr>
<tr><td>5 method of application ;</td></tr>
<tr><td>6 other valid factor ; e.g. frequency of application</td><td>11 relevant corresponding discussion point ;</td></tr>
</table></td><td>3</td><td></td></tr>
<tr><td>6(b)(i)</td><td>any two from:
fewer insects, eat / damage crops / AW ;
improved (quality / yield) of crops / AW ;
prevents spread of diseases (carried by insects) ;
AVP ; quick effect (to the treatment) / application is easy / not labour intensive</td><td>2</td><td></td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6(b)(ii)</td><td>
<table>
<tr><th>chemical</th><th>benefit</th></tr>
<tr><td>magnesium ;</td><td>for chlorophyll / photosynthesis ;
more, growth / yield ;</td></tr>
<tr><td>nitrates ;</td><td>for, amino acids / (to synthesize) proteins ;
more, growth / yield ;</td></tr>
<tr><td>carbon dioxide ;</td><td>increased photosynthesis ;
more, growth / yield ;</td></tr>
<tr><td>water ;</td><td>prevent wilting ; ref. to turgor / ref. to dissolving solutes ;</td></tr>
<tr><td>herbicides ;</td><td rowspan="2">reduced (named) competition with weeds ;
more, growth / yield ;</td></tr>
<tr><td>2,4 D / (synthetic) plant hormones ;</td></tr>
<tr><td>AVP ;; e.g. other valid chemicals or ions such as phosphate
/ potassium
/ fungicide</td><td>relevant benefit ;;
e.g. more , growth / yield

reduced competition with fungi / prevent disease</td></tr>
</table>
</td><td>3</td><td>max 2 from chemical column
table rows indicate paired mark points

A fertilisers once as an alternative if no named ions given</td></tr>
<tr><td>6(c)(i)</td><td>reduced predation / improve chance of survival / increased fitness / AW ;</td><td>1</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
6(c)(ii)	*any two from:* (tobacco) contains nicotine **;** (nicotine) is addictive **;** ref. to withdrawal symptoms **;**	**2**	
6(c)(iii)	*any two from:* COPD **;** lung cancer **;** coronary heart disease / CHD **;** AVP **;** e.g. gum disease / bronchitis	**2**	
6(c)(iv)	*any one from:* tar **;** dust particles / AW **;**	**1**	

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