Cambridge Assessment International Education

Cambridge IGCSE™

BIOLOGY **0610/41**

Paper 4 Theory (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 80

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level 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.

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5 'List rule' guidance (see examples below)

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.

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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mark scheme abbreviations

- **;** separates marking points
- / alternatives
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- **I** ignore as irrelevant
- **AW** alternative wording (where responses vary more than usual)
- **AVP** alternative valid point
- **ora** or reverse argument
- underline actual word given must be used by candidate (grammatical variants excepted)

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>one mark for each column:

<table>
<tr><th rowspan="2"></th><th rowspan="2">diaphragm</th><th colspan="2">intercostal muscles</th><th rowspan="2">pressure change in the thorax</th></tr>
<tr><th>internal</th><th>external</th></tr>
<tr><td>breathing in</td><td>contract</td><td>relax</td><td>contract</td><td>decreases (A increases)</td></tr>
<tr><td>breathing out</td><td>relax</td><td>contract / relax</td><td>relax</td><td>increases (A decreases)</td></tr>
</table>
;;;;</td><td>4</td></tr>
<tr><td>1(b)</td><td>any two from:
thin / short distance (for diffusion) ;
well supplied by blood / surrounded by capillaries / AW ;
good ventilation with air ;</td><td>2</td></tr>
<tr><td>1(c)(i)</td><td>a group of cells with similar structures ;
working together to perform a shared function ;</td><td>2</td></tr>
<tr><td>1(c)(ii)</td><td>any two from:
forms incomplete rings around, trachea / bronchi ;
keeps (named) airways open ;
reduces resistance to movement of air ;
protects (named) airways ;
sound production in larynx ;</td><td>2</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>one mark per row:
<table>
<tr><th>substance</th><th>enzyme</th><th>product(s)</th></tr>
<tr><td>starch</td><td>amylase</td><td>maltose / glucose / (simple) sugar(s)</td></tr>
<tr><td>fat</td><td>lipase</td><td>fatty acid(s) and glycerol</td></tr>
<tr><td>protein</td><td>protease / pepsin / trypsin</td><td>amino acids</td></tr>
</table>
;;;</td><td>3</td></tr>
</table>

Question	Answer	Marks
2(b)	*any four from:* biological washing powder is more effective, at lower temperatures / between 10 °C and 40 °C / 10 °C and 43 °C **;** comparative data quote for the difference at a stated temperature **;** biological washing powder removes all stain between 30 °C and 40 °C **;** non-biological removes all stain only at 60 °C **;** effectiveness is similar, at high temperatures / between 50 and 60 °C **;** same trend, below 30 °C / at low temperatures / from 50 °C **;** *idea of* effectiveness of biological washing powder decreases between 40 °C and 44 °C, no such decrease for non-biological washing powder **;**	**4**
2(c)	*any two from:* active site changes shape **;** substrate no longer fits into, enzyme / active site **;** no enzyme-substrate complex / no successful collisions **;**	**2**

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Question	Answer	Marks
2(d)	*any two from:* individual people have, different / unique, DNA **;** DNA has genes *or* alleles have, sequences of bases **;** AVP **;**	**2**

Question	Answer	Marks
3(a)(i)	*any three from:* blue at time 0 indicates no glucose present **;** ensures that no glucose on outer surface of dialysis tubing / in water, as a result of an error **;** green / yellow / red, indicates presence of glucose **;** glucose, diffuses / moves, out of dialysis tubing / into water **;** (movement is) down the concentration gradient / high to low concentration **;** dialysis tubing is permeable to glucose **;** AVP **;**	**3**
3(a)(ii)	*idea that* (Benedict's solution) changes colour quicker / gives more intense colour / AW **;**	**1**
3(b)	**A** are microvilli **;** *function:* allow movement of substances into the cell **/** increase surface area for absorption by diffusion OR active transport **/** have proteins in the membrane for active transport **;** **B** is the (rough) endoplasmic reticulum / (R)ER **;** *function:* site of protein synthesis **/** modify proteins **/** assemble amino acids in a specific sequence to make (named) protein **;** **C** is a mitochondrion **;** *function:* aerobic respiration **/** provides energy for (named) cell process(es) **;**	**6**
3(c)(i)	chloride **;**	**1**

Question	Answer	Marks
3(c)(ii)	*any four from:* loss of water ; by osmosis / down water potential gradient ; diarrhoea ; dehydration ; loss of other, (named) ions / salt(s) ; AVP ;	**4**

Question	Answer	Marks
4(a)(i)	*Sorghum* ;	**1**
4(a)(ii)	feathery stigma / stigma with large surface area ; stigma / anthers, hang outside the flower(s) ;	**2**
4(b)(i)	**C** ovary (wall) ; **D** ovule ; **E** style ;	**3**
4(b)(ii)	meiosis / reduction division ; haploid ; fuses / joins / combines ; diploid ; fertilisation ; zygote ; mitosis ;	**7**

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Question	Answer	Marks
4(c)	*any five from:* (gives) genetic variation / diversity ; ref to, alleles / genes / DNA, from different, plants / parents ; allows mutations to be, expressed / AW ; allows adaptation to, new conditions / changed environment / AW ; (new species) can evolve / allows natural selection to occur ; pollen exchanged between individuals / cross pollination ; seeds are dispersed ; can colonise new areas / AW ; less competition (with parent plant / among offspring) ; seeds may be dormant ; survival through, harsh / adverse, conditions ; AVP ;	**5**
4(d)	*any three from:* protein synthesis ; transport in the phloem ; cell division / mitosis / meiosis ; active transport / absorption of ions (from the soil) ; growth ; movement / muscular contraction ; sensitivity ; nerve impulses ; AVP ;;;	**3**

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Question	Answer	Marks
5(a)	*any two from:* *assume features are of protoctists unless told otherwise* nucleus / nuclear membrane / nuclear envelope ; (named) organelle(s) / internal membranes ; cell walls (if present) have different composition ; linear chromosomes ; AVP ;	**2**
5(b)	*box 2:* (organism) has two rings of cilia / (organism) stalk absent / AVP ; *box 4:* (organism) has a covering of cilia / (organism) fused cilia absent / AVP ;	**2**
5(c)	movement AND nutrition ticked ;	**1**
5(d)(i)	bacteria ⟶ *Paramecium* ⟶ *Didinium* ;	**1**
5(d)(ii)	*any two from:* ciliates eat (many) bacteria ; *Didinium* / predatory ciliates, eat other (named) ciliates ; ciliates may eat, dead / decomposing, material ;	**2**
5(d)(iii)	*any three from:* removal of, harmful bacteria /pathogens, from sewage ; e.g. cholera bacteria *or* any other water born disease / parasites ; stop spread of pathogens via water ; use of chlorination / chemical treatment ;	**3**
5(d)(iv)	*any three from:* conversion of ammonia / ammonium (ions), to nitrate (ions) ; convert ammonium ions to nitrite ions ; make nitrate ions available to plants ; nitrate ions are absorbed by plants ; nitrate ions are used to make, amino acids / proteins ;	**3**

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Question	Answer	Marks
6(a)	transmission of genetic information from generation to generation **;**	**1**
6(b)(i)	1 correct use of X and Y in responses for individual 5 and individual 8 **;** 2 correct X allele given for individual 5: $\mathbf{X^bY}$ **/ b ;** 3 correct X allele given for individual 8: $\mathbf{X^BY}$ **/ B ;**	**3**
6(b)(ii)	*any three from:* colour blindness is a sex-linked characteristic **;** she is, heterozygous for the gene / **Bb ;** she has, normal allele / **B**, so has normal colour vision **;** but has passed on the, recessive allele / **b,** to her sons / 5 and 7 **;** she has two **X** chromosomes which have the gene for colour vision **;** father / 4, passes on his **Y** chromosome **;**	**3**
6(b)(iii)	*any two from:* mutation **;** to give, recessive allele / **b ;** occurred in 3 *or* in one of her parents / 1 or 2 *or* her grandparents **;** AVP **;** e.g. other reason such as donated gamete	**2**

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