Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/22**

Paper 2 AS Level Structured Questions **May/June 2020**

MARK SCHEME

Maximum Mark: 60

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.

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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.

Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ecf	error carried forward
underline	actual word underlined must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument

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Question	Answer	Marks
1(a)	*any two from* protein coat / capsid **;** **A** capsomeres nucleic acid core / DNA or RNA **;** acellular / AW **;**	**2**
1(b)	*any three from* *no, because* resolution of light microscope, too low / not high enough **;** only able to distinguish points 200nm or more apart *or* size of virus / 30 nm, too small for resolution of (light microscope) of 200 nm **;** **A** range 100-300 nm wavelength of light too long **;** *idea that* virus too small to interfere with light waves **;**	**3**
1(c)	*any three from* virus binds to receptors (on host cell surface membrane) **;** *ref. to* specificity / complementary shapes / complementary binding **;** endocytosis **;** description **;** e.g. membrane infolds / pinches in vesicle formed **;** **A** vacuole	**3**

Question	Answer	Marks
2(a)	sinoatrial node / SAN, sends out, wave of excitation / impulses / electrical impulses **;** R nerve impulses wave of excitation / AW, spreads across atrial wall **;**	**2**
2(b)	*any two from* non-conducting fibres between atrial and ventricle walls **;** impulse must pass down septum **;** AVN (in interatrial septum) delays impulse **;** (gives) time for atria to, complete contraction / empty **;**	**2**

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Question	Answer	Marks
2(c)(i)	one mark if **F** and **G** are semilunar and **E** and **H** are bicuspid **;** one mark for **E** and **G** opens **;** one mark for **F** and **H** closes **;** ***E*** *bicuspid / (left) atrioventricular, valve, closes* ***F*** *semilunar / aortic, valve opens* ***G*** *semilunar / aortic, valve closes* ***H*** *bicuspid / (left) atrioventricular, valve opens*	**3**
2(c)(ii)	(during contraction) left ventricle, generates / AW, higher pressure (than left atrium) **;** **A** do not produce the same pressure when contracting *any one from* (because) wall of left ventricle thicker / more (cardiac) muscle, so reaches higher **;** data from Fig. 2.1 to show difference in pressure **;**	**2**

Question	Answer	Marks
3(a)	*Mycobacterium tuberculosis* **;** **A** *Mycobacterium bovis*	**1**
3(b)	*any one from* live in an area that has cases of TB **;** recently returned from countries with TB **;** born in a country with TB **;** parents / grandparents whose origin country has TB **;** contact with a person who has TB **;** AVP **;** e.g. *ref. to* compromised immune system mother who is HIV-positive	**1**

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Question	Answer	Marks
3(c)	*any three from* decrease in incidence over time for all groups *or* decrease in incidence over time for low, lower middle, upper middle and plateau for high income group **;** one example of, large / AW, differences in incidence **;** e.g. between, upper middle income and, low / lower middle between high income and, low / lower middle / low and lower middle **;** between upper middle and high **;** decrease in incidence with income group increase (for each year), generally / overall / except for 2015 / 2016 low to lower middle **;** low and lower middle similar incidence **;** data / manipulated data, to support any of above points **;**	**3**
3(d)	*any two from* *max 1 if no ref. to antigens* leprosy bacterium has similar (shaped) antigens **;** memory cells, recognise / bind, antigens on leprosy bacterium **;** anti-TB antibodies also bind to leprosy antigens **;** AVP **;** e.g. similar / same, genes so synthesise similar proteins	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(e)</td><td>any three from

<table>
<tr><th>artificial active</th><th>natural passive</th></tr>
<tr><td>deliberate / AW
A from medical staff</td><td>or not deliberate / from mother / in breast milk / across placenta ;</td></tr>
<tr><td>vaccine / (foreign) antigens in injection</td><td>or antibodies passed on ;</td></tr>
<tr><td>immune response</td><td>or no immune response ;</td></tr>
<tr><td>antibodies / memory cells produced</td><td>or no, antibodies / memory cells produced ;</td></tr>
<tr><td>longer lasting</td><td>or short-lived ;</td></tr>
<tr><td>protection not immediate</td><td>or immediate protection ;</td></tr>
</table></td><td>3</td></tr>
</table>

Question	Answer	Marks
4(a)	much / AW, rough endoplasmic reticulum / rough ER / RER for, polypeptide / protein / collagen, synthesis ; **A** for translation many mitochondria provide, energy / ATP, for, polypeptide / protein / collagen, synthesis ; large nucleus indicates, active cell / (much) transcription ;	**2**
4(b)(i)	*any two from* in trachea ; in, bronchus / bronchi ; *if only one correct structure named, allow one qualification mark* *trachea* C-shaped / incomplete, rings ; surround smooth muscle ; *bronchus* plates / irregular ;	**2**

Question	Answer	Marks
4(b)(ii)	*any two from* keep airways open **;** provides support **;** allow flexibility **;** *allow described e.g. bending neck, swallowing food* rings allow, lengthening / widening, during, breathing in / inspiration / inhalation **;**	**2**
4(c)(i)	peptide (bond) **;**	**1**
4(c)(ii)	*any three from* collagen, structural / fibrous, protein *or* collagen gives strength / flexibility **;** glycine / gly, small / smallest, amino acid **;** **A** has H as, R-group / side chain glycine / gly, regular / every third amino acid **;** (so) triple helix tightly packed / three polypeptides closely associated / AW ; *ref. to* (peptide bond) NH of gly can form hydrogen bond with (peptide bond) C=O of adjacent amino acid (in other polypeptide) **;**	**3**

Question	Answer	Marks
5(a)	presence of sucrose (in sieve tube) lowers water potential (of phloem sap) **;** **A** makes water potential more negative water enters (sieve tube), by osmosis / down water potential gradient **;** increases volume (in sieve tube) **;** increases <u>hydrostatic</u> pressure (in sieve tube at source) **;** **A** turgor pressure *ref. to* lower <u>hydrostatic</u> pressure (in sieve tube at sink) **;** *allow ecf for no ref. to, hydrostatic / turgor* detail **;** e.g. sucrose removed at sink water follows sucrose that exits sink movement of, (phloem) sap / sucrose, down pressure gradient / from high to low hydrostatic pressure **;** <u>mass flow</u> **;**	**4**
5(b)(i)	<u>glycosidic</u> **;**	**1**

Question	Answer	Marks
5(b)(ii)	nucleotide components are base, pentose sugar, phosphate **;** UDP has, uracil and ribose and two phosphates / one extra phosphate **;**	**2**
5(b)(iii)	*max three if describing breakdown of sucrose* *allow points from diagrams* *any four from* *induced fit* shape of, substrates / UDP and glucose, not (fully) complementary to shape of active site (of sucrose synthase) **;** *lock and key* shape of, substrates / UDP and glucose, complementary to shape of active site (of sucrose synthase) **;** *allow ecf if no ref. to shape* *induced fit* active site flexible / moulds around, substrates / UDP and glucose **;** AW *lock and key* active site does not change shape / is not flexible / AW **;** *induced fit* (active site moulds around so) *idea of* provides better fit / fully complementary **;** *lock and key* substrate fits into active site **;**	**4**
5(c)	<u>α-glucose</u> **;** **A** glucose **R** β-glucose α, 1-4 **;** α, 1-6 **;** *bond types either way round* glycogen **;**	**4**

Question	Answer	Marks
6(a)	**Stage of cell cycle** (G_1 phase) – interphase ; S phase – interphase ; G_2 phase ; – interphase ; prophase – (mitosis) metaphase – (mitosis) anaphase ; – (mitosis) (telophase) – (mitosis) (cytokinesis) *one mark for interphase* *one mark for S phase and G_2 phase in correct sequence* *one mark for prophase, metaphase and anaphase in correct sequence*	**3**
6(b)	Vincristine: ✓ ✓ x x ; 5-fluorouracil : x x x x ;	**2**

Question	Answer	Marks
6(c)	*any three from* *blood smear differences* large / larger, numbers of lymphocytes **;** more lymphocytes than normal blood smear **;** *as blood smear or lymphocyte difference* immature / not fully developed **;** *ref. to* no large nuclei / nuclei not pronounced small nuclei **; A** nuclei not visible *lymphocyte difference* non-functional / AW **;** detail of lack of function for either B-lymphocytes or T-lymphocytes **;** AVP **;** e.g. *ref. to* difficult to distinguish between lymphocytes and monocytes **; A** no monocytes visible	**3**