Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/21**

Paper 2 AS Level Structured Questions **October/November 2019**

MARK SCHEME

Maximum Mark: 60

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 2019 series for most Cambridge IGCSE™, Cambridge International A and 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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Mark scheme abbreviations

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

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Question	Answer	Marks
1(a)(i)	**A** amino / amine group **;** **B** carboxyl (group) **; A** carboxylic acid	**2**
1(a)(ii)	peptide bond joining nitrogen from amine group to carbon of carboxyl group on adjacent amino acid **;** C = O and N – H shown correctly in the dipeptide **;** formation of water molecule **;**	**3**
1(b)(i)	label line to any area of the nucleus **;**	**1**
1(b)(ii)	correct formula **;** e.g. actual diameter = image length / magnification 15 (µm) **;**	**2**
1(b)(iii)	*any one valid suggestion* **;** e.g. *idea of* only very thin section of cell mitochondria found in other sections	**1**
1(c)	*two from* *idea that* reduces resistance to flow through sieve tube **;** *idea that* less space taken up so increased volume of sap / AW, can pass through (per unit time) **;** pressure flow / mass flow, does not need energy from the cell / AW**;** AVP **;** (organelles not needed as) metabolic reactions / AW, carried out by the companion cell **;**	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(i)</td><td>Mycobacterium tuberculosis
or
Mycobacterium bovis ;</td><td>1</td></tr>
<tr><td>2(a)(ii)</td><td><table><tr><td>artificial active immunity</td><td>✓ ;</td></tr><tr><td>artificial passive immunity</td><td></td></tr><tr><td>natural active immunity</td><td></td></tr><tr><td>natural passive immunity</td><td></td></tr></table></td><td>1</td></tr>
<tr><td>2(b)(i)</td><td>three from
changes the tertiary structure / shape of active site, of , enzyme / RNA polymerase ;
active site no longer complementary to, RNA nucleotides / substrate ; AW
RNA nucleotides not joined / mRNA not synthesised ; A transcription does not occur
translation prevented ; A described, I polypeptide / protein synthesis prevented
AVP ; ref. to other roles of RNA polymerase not occurring, e.g. does not bind to DNA, double helix does not unwind</td><td>3</td></tr>
<tr><td>2b(ii)</td><td>two from
(from 2009 to 2013) overall increase in number of cases (of RR-TB and MDR-TB) ;
use of data to support overall trend ;
ref. to large increase between 2011 and 2012 / 2013
or
very little change between 2010 and 2011 ;</td><td>2</td></tr>
</table>

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Question	Answer	Marks
2(b)(iii)	*four from* overuse of, antibiotics / rifampicin **or** example of over use **;** e.g. taking for viral infection, over prescribing for bacterial infection people not completing course of antibiotics **;** reservoir of bacteria remains **;** *ref. to* mutation **;** any detail of the mutation **;** e.g. protein produced has a changed binding site bacteria with resistance, survive / selected for **or** only bacteria sensitive to antibiotic are, killed / selected against **; A** antibiotic acts as a selection pressure bacteria reproduce and pass on, gene / allele, for resistance to offspring **or** vertical (gene) transmission **;** (alleles for resistance to antibiotics transferred by) horizontal (gene) transmission / described **;** frequency of resistance, gene / allele, increases in the bacterial population **;**	**4**

Question	Answer	Marks
3(a)	between 0 – 0.2 mol dm^{-3} the mass of the potato increases **or** between 0.2 – 1.0 mol dm^{-3} the mass of the potato decreases **;** no change in mass at 0.2 mol dm^{-3} **;** from approximately 0.2 mol dm^{-3} increasing concentration gives a greater decrease **;** comparative data quote including two concentrations and two percentage changes **;** *units for concentration of sucrose and reference to percentage change in mass must appear once to award this point*	**3**
3(b)	*three from* *decrease in mass because* water (molecules) leave the cells **;** by osmosis **;** down a water potential gradient / from higher water potential to lower water potential **or** solution has a more negative water potential than the potato tissue **;** *ref. to* plasmolysis / loss of turgidity **;**	**3**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>A neutrophil ; A polymorphonuclear, leucocyte / granulocyte
B lymphocyte ;</td><td>2</td></tr>
<tr><td>4(b)(i)</td><td>
<table>
<tr><th>substance</th><th>concentration in lymph compared to the concentration in blood</th></tr>
<tr><td>oxygen</td><td>lower</td></tr>
<tr><td>carbon dioxide</td><td>higher</td></tr>
<tr><td>red blood cells</td><td>lower</td></tr>
</table>
three rows correct = 2 marks
one row or two rows correct = 1 mark</td><td>2</td></tr>
<tr><td>4(b)(ii)</td><td>two from
immune response occurs (linked to antibody / cytokine production) ;
increased concentration / production of / AW, of antibodies (which are protein) ;
AVP ; e.g. cytokine production</td><td>2</td></tr>
<tr><td>4(c)(i)</td><td>two from
emits, impulses / waves of depolarisation / waves of excitation / AW ;
at regular intervals / AW ; e.g. acts as a pacemaker
spreads across the, atria / atrial muscles / AW
or
stimulates / AW, atrial, contraction / systole ;
A initiates, heart beat / contraction of the heart</td><td>2</td></tr>
</table>

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Question	Answer	Marks
4(c)(ii)	*three from* faster heart rate / increased rate of contraction (of ventricles) **;** no, slowing / delay of, impulse / wave of excitation / AW, by AVN **;** more impulses reaching the ventricle per unit time **;** ventricles may contract before they are full **;** irregular heart rate **;** AVP **;** e.g. may have no effect if only a small proportion of impulses pass through suggestion that ventricles may not contract from apex up	**3**

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Question	Answer	Marks
5(a)	*two from* *ref.to* non-self / foreign (antigen) **;** ***one*** *from* activation / AW, of lymphocytes **;** *ref. to* specificity **;** *ref. to* immunological memory **;**	**2**
5(b)(i)	*three from* (B-) lymphocytes respond / immune response, to self antigens (on muscle cell surface) / antibody produced by, B-lymphocytes / plasma cells **; A** failure to distinguish between self and non-self antibody binds to receptor **;** antibody has complementary shape to receptor **; A** idea of specificity cell signalling molecule / neurotransmitter / AW, unable to bind to receptor **;** reactions / AW, within cells, not triggered / described **;**	**3**
5(b)(ii)	*three from* active site of enzyme **Y** is, not (fully) complementary / partially complementary **;** active site, moulds to fit / becomes fully complementary to, cell signalling molecule **;** enzyme-substrate complex forms **; A** ESC forms *ref. to* interaction between substrate and R groups of enzyme amino acids **;** lowers activation energy **;** products leave the active site **;** enzyme molecule unchanged / able to be re-used **;** AVP **;** e.g. detail of how activation energy is lowered	**4**
5(c)	*three from* **I** *statements about locating or diagnosis of disease* specific / targeted, therapy / treatment **;** AW **A** only affects, one cell type in the body / B lymphocytes bind to / recognition of, receptors / antigens / CD20, on cell surface (of diseased cells) **; A** in context of B lymphocytes or diseased cells monoclonal antibodies, are not recognised as foreign / do not trigger an immune response **; A** *ref. to* humanisation of antibodies example of presence of monoclonal antibody stimulating the immune system / AW **;** *in context of examples given* **A** stimulates phagocytosis / activates B-cells attach, radioactive substance / drug (to treat / kill, B lymphocytes / diseased cells) **;** *must be in context*	**3**

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Question	Answer	Marks
6(a)	*three from* joins a nucleotide to extending, polynucleotide / strand **;** (only allows) complementary base pairing **;** forms phosphodiester bonds (between nucleotides) / forms the sugar phosphate backbone **;** proofreading the new strand **;** repairs any mismatched base pairs **;**	**3**
6(b)(i)	stops, cell cycle / mitosis / cell division / cell replication / AW **;**	**1**
6(b)(ii)	thymine only present in DNA / no thymine in RNA **;** uracil (nucleotide) replaces thymine (nucleotide) in transcription **;**	**1**
6(c)(i)	cytokinesis **;**	**1**
6(c)(ii)	*three from* tobacco smoke / tar, contains (named) carcinogens **;** cause, damage to DNA / mutations **;** detail **;** e.g. proto-oncogenes to oncogenes / tumour suppressor genes switch off (in) epithelial cells in the, trachea / bronchus / gas exchange system / lungs **;** uncontrolled, mitosis / cell division **;** AVP **;** e.g. forms a mass of undifferentiated cells / AW cells do not respond to signals	**3**

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