Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/23**

Paper 2 AS Level Structured Questions **October/November 2018**

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 2018 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.

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.

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

Question	Answer	Marks
1(a)	*any three from* **1** modification / process / described, of, proteins / polypeptides **;** **2** further detail of modification **;** e*xamples of modification* folding of polypeptides / protein folding assembly of polypeptides to form quaternary structure addition of (named) prosthetic group addition of sugars / addition of carbohydrate / glycosylation cutting of polypeptides removal of, methionine / first amino acid making proteins functional **3** packaging into vesicles / formation of Golgi vesicles / formation of secretory vesicles **;** **A** 'budding off' / 'breaking off' / transport proteins in Golgi vesicles **4** formation of (primary) lysosomes **;** **5** AVP **;** e.g. modification of lipids synthesis of, phospholipids / glycolipids synthesis of cell wall polysaccharides	**3**
1(b)(i)	(mitochondria) provide / make / produce, ATP **;** **A** needs a lot of, ATP / energy **R** 'produce / make, energy' (ATP / energy required for) protein synthesis / movement of (secretory / Golgi) vesicles / exocytosis **;**	**2**

Question	Answer	Marks
1(b)(ii)	*any two from* **1** mitochondria have (circular) DNA **;** **2** mitochondria, have / make, (70S) ribosomes (for, protein synthesis / translation) **;** **R** if 80S ribosomes **3** mitochondria can divide **;** **R** by mitosis **4** AVP **;** **5** AVP **;** e.g. (mitochondrial / mt) DNA codes for (some mitochondrial) proteins mRNA transcribed from mtDNA mitochondria produce their own tRNA can replicate DNA **I** mitochondria have a double membrane	**2**
1(c)(i)	*any three from* protein coat / capsid **;** **A** protein layer **R** 'cell wall of protein' nucleic acid (core) **;** **R** if 'in a nucleus' <u>DNA or RNA</u> **;** acellular / non-cellular / 'not a cell' **;** size – *accept within range* 15 nm to 1000 nm **;** AVP **;** e.g. (protein coat made of) capsomeres surrounded by, membrane / envelope / (phospho)lipid bilayer **I** antigens / enzymes	**3**
1(c)(ii)	*any one from* (viruses) pass through plasmodesmata **;** **A** 'cytoplasmic strands, through cell walls / between cells' via symplast pathway **;**	**1**

Question	Answer	Marks
2(a)(i)	water shown formed from –OH and –H **;** **A** H_2O formed without indicating where from peptide bond shown correctly between C of carboxylic acid and N of amino group **;** complete dipeptide drawn **;** **A** hydrogen 'up or down'	**3**
2(a)(ii)	R group / side chain / variable group / residual group / functional group **;** indicate, different amino acids / type of amino acid **;** **A** specific to each amino acid **A** the two amino acids are different **A** two examples of R groups, e.g. –H and $–CH_3$ both amino acids have different R groups = 2 marks	**2**
2(b)	*any two from* straight chain / linear, v helix / helical **;** **I** coil(ed) **R** branched / branching β-glucose, not α-glucose **;** **A** β-1:4 glycosidic bond v α-1:4 glycosidic bond (β-)glucose / monomers / residues, are arranged, rotated 180° to each other / AW **;** AVP **;** e.g. more hydrogen bonds	**2**

Question	Answer	Marks
2(c)	*any four from* **1** (molecules) form fibrils and fibres **;** **2** hydrogen bonding between (cellulose) <u>molecules</u> **;** **3** (cellulose molecule) is straight / linear **;** **4** (straight chain allows) molecules lie parallel to each other **;** *mp4 dependent on mp3* **5** gives strength (to cell wall) to, prevent cell bursting / withstand (turgor) pressure / AW **;** **R** if only in context of a cellulose molecule **6** *ref.* to fibres at angles / criss-cross / AW **;** **7** *idea of* many gaps, in wall / between fibres, allowing passage of water / named) substances / making cell wall permeable **;** **I** plasmodesmata **R** partially / AW, permeable **8** AVP **;** e.g. cellulose is insoluble many –OH groups (for hydrogen bonding)	**4**

Question	Answer	Marks
3(a)(i)	**D** (nitrogenous organic / nucleotide) base **;** **A** pyrimidine / uracil / cytosine **R** purine **E** ribose **;** **I** pentose **F** phosphate (group) **;**	**3**
3(a)(ii)	*any one from* two, strands / polynucleotides (not one) **;** **A** two chains **R** polypeptides deoxyribose (not ribose) **;** **A** correct ref. to –OH (on C2) instead of –H group on the pentose / sugar thymine (not uracil) **;** **R** thiamine have base pairs **;** (double) helix / helical (not straight chain) **;** longer **;**	**1**
3(b)	*any four from* **1** template RNA binds to (part of) region **X ;** **2** in active site of, telomerase / enzyme **;** **3** DNA / free, nucleotides, pair with / bind to / align with, RNA **;** **4** ref. to complementary, bases / base pairs **;** **5** A–T and C–G and U–A **;** **6** phosphodiester bonds form, between (DNA) nucleotides / AW **;** treat as neutral any *refs.* to likely enzymes, e.g. ligase, etc. **7** telomerase moves, in the direction of the arrow / to the right **;** **8** AVP **;** e.g. hydrogen bonds between bases telomerase acts as a reverse transcriptase	**4**

Question	Answer	Marks
3(c)	*prokaryotes* have, circular DNA **;** **A** 'loop of DNA' **I** plasmid(s) do not have telomeres **;** do not have chromosomes **;** AVP **;** e.g. 'DNA has no ends'	**1**
3(d)	*any two from* cancer cells divide, uncontrollable / continuously **; ORA** **A** cancer cells divide but do not undergo cell death telomerase is required to ensure, chromosomes, do not shorten **;** telomerase is, synthesised / produced / found, in cancer cells **; ORA** high levels of telomerase indicate cells that are cancerous / AW **;** AVP **;** e.g. *idea that* gene for telomerase switched on	**2**

Question	Answer	Marks
4(a)	*any four from* **I** signals **R** nerve impulse first time *SAN* **1** acts as a pacemaker / initiates heart beat / initiates cardiac cycle **;** **A** regulates heartbeat **A** described, e.g. as rhythm / emits impulses at regular intervals **2** releases / AW, waves of excitation / (electrical) impulses **;** **A** *ref.* to, action potentials / depolarisation **R** nerve impulses **3** spread across / AW, atria / atrial walls **or** leads to atrial, systole / contraction(s) **;** *AVN* **4** allows a (short) delay / ~0.1 s **;** **5** passes the impulse / wave of excitation, to the Purkyne fibres / down the septum **;** **A** Bundle of His **R** nerve impulse **6** detail **;** e.g. so atria contract before ventricles allows ventricles to fill / allow atria to empty completely so atria have, emptied / contracted, before ventricular contraction begins so atria and ventricles don't contract at the same time	**4**
4(b)	*any two from* contraction / ventricular systole, begins at the base of the ventricles **;** both ventricles contract at the same time **;** blood is forced, upwards / into arteries / through (named) semi-lunar valves **;** **A** pushed *idea that* so ventricles, empty / pump out most of the blood **;** AVP **;** e.g. so impulses / waves of excitation, travel upwards from the base	**2**

Question	Answer	Marks
4(c)	*any four from* **1** noradrenaline is, signalling, molecule / compound **;** **A** noradrenaline is the signal **I** noradrenaline is a (neuro)transmitter **2** SAN cell is the <u>target</u> cell **;** **3** noradrenaline / signalling molecule, binds to (cell surface) receptors (of target cell) **;** **A** 'fits' **R** 'receptor cells' **4** receptors are specific to noradrenaline **;** **A** *ref.* to complementary (shapes) **5** *ref.* to formation of cAMP / second messenger *or* activating enzyme ; **6** response is the opening of channel proteins (so calcium ions enter) **;**	**4**

Question	Answer	Marks
5(a)(i)	*Mycobacterium*, *tuberculosis* / *bovis* **;**	**1**
5(a)(ii)	*any three from* **1** phagocytes / macrophages / neutrophils / elastase, breaks down / weakens, alveolar walls **;** **2** (reduced elastin so) alveoli cannot stretch and recoil / alveoli overstretch **;** **3** alveoli burst / one large air sac formed **;** **4** surface area (for gas exchange) is reduced **;** **5** less oxygen absorbed by blood / reduced oxygen supply (to tissues) / not enough oxygen for (aerobic) respiration / AW **;**	**3**
5(b)	**R** cost *any five from* **1** *Transmission* **;** e.g. aerosol / droplet, infection **I** airborne **A** lack of pasteurised milk overcrowded, housing / living conditions / AW migration / travel, from areas with high rates of TB reservoir of infection in people not, diagnosed / not treated ***2*** *HIV* / *immunodeficiency* **;** e.g. infection with HIV may activate (dormant) TB (pathogen) immunodeficiency / AW, makes people more susceptible to TB intravenous drug taking increases risk of, immunodeficiency / HIV **3** *Diagnosis is difficult* **;** e.g. TB (pathogen) remains dormant / symptomless carriers limited access to health care for diagnosis / AW *idea that* contact tracing is difficult	**5**

Question	Answer	Marks
5(b)	**4** *Treatment* **;** e.g. treatment is long term / treatment may not start early enough people may not finish the course of treatment limited access to health care for treatment **5** *Acquired resistance* **;** e.g. bacterium / TB (pathogen), develops resistance to, antibiotic(s) / drug(s) multi-drug resistance / MDR-TB / XDR-TB **6** *Vaccination* **;** e.g. vaccine may not always be effective in providing protection difficult to achieve herd immunity concerns / misconceptions, about vaccination limited access to vaccination (programmes) poor (immune) response in people who are malnourished poor thermostability of vaccine **7** *Education* **;** e.g. limited education / low awareness, about prevention for general population limited education / low awareness, for health care professionals	**5**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)(i)</td><td>[A] C E D B F ;</td><td>1</td></tr>
<tr><td>6(a)(ii)</td><td>I early and late except where indicated

<table>
<tr><th>event in the cell cycle</th><th>name of the stage in the cell cycle</th></tr>
<tr><td>DNA replication</td><td>interphase / S phase ;</td></tr>
<tr><td>division of centromeres</td><td>anaphase ;
R late anaphase</td></tr>
<tr><td>condensation of chromatin</td><td>prophase ;</td></tr>
<tr><td>contraction of spindle fibres</td><td>anaphase ;</td></tr>
<tr><td>organisation of chromosomes at the equator</td><td>metaphase</td></tr>
</table>
</td><td>4</td></tr>
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Question	Answer	Marks
6(b)	**I** antibodies have receptors *any three from* **1** clones / AW, of B/T cells consist of very few cells **;** AW = types of / specific / groups of **2** (mitosis occurs) during <u>clonal expansion</u> **;** **3** many, B cells / plasma cells, to make antibodies **;** **4** many, T-helper / T_h, cells to secrete, cytokines / lymphokines / interleukins **;** **5** many, T-killer cells / T-cytotoxic cells, to kill, infected cells / cancer cells **;** **6** memory cells are produced for, secondary response / faster response (when antigen encountered again) **;** **A** during a secondary infection (implying of the same pathogen) **7** need to make genetically identical cells **;**	**3**