Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/22**

Paper 2 AS Level Structured Questions **May/June 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 May/June 2019 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.

Mark scheme abbreviations

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
I	ignore (for answers that include irrelevant information that does not contradict the expected answer)
AW	alternative wording (where responses vary more than usual)
ora	or reverse argument (for answers which are written as the opposite to the expected answer)
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ecf	error carried forward
mp	marking point (with relevant number)

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Question	Answer	Marks
1(a)	stem / not a root, because, transport tissue / vascular bundles / vascular tissue(s) / xylem and phloem / xylem / phloem, around the edges / not in the centre / AW **;** **A** stem because, pith / parenchyma tissue, is in the centre	**1**
1(b)	*any two from:* (hydrostatic) support / described **;** **R** *if incorrect context e.g. support because of thick cell walls* **A** packing tissue (cells), turgid / store <u>water</u> **;** storage **;** *in context of substances other than water e.g. sucrose / starch / waste*	**2**
1(c)(i)	vascular bundle **;**	**1**
1(c)(ii)	0.65 (<u>mm</u>) **;**	**1**

Question	Answer			Marks
1(d)	*mp1-3 must have statements for both xylem and phloem* *mp4-7 need statements for either xylem or phloem* *three from:*			**3**
	xylem		*phloem*	
	1 no cytoplasm / hollow / no contents		(peripheral / little / some) cytoplasm **;** **I** protoplasm **R** full of cytoplasm / AW	
	2 no organelles / hollow / no contents		(a few) organelles **;** **A** examples of organelles mitochondria or ER **I** has SER / RER / ribosomes **R** has nucleus	
	3 lignified **R** idea of lignin within element		no lignin / (only) cellulose **;**	
	4 no end wall(s) / no sieve plate(s) **A** end walls have broken down	**or**	sieve plate(s) / perforated end wall(s) **;** **A** (end walls) have sieve pores	
	5 (side walls) contain pits	**or**	no pits (in side walls) **;**	
	6 no plasmodesmata	**or**	plasmodesmata (to companion cells) **;**	
	7 thick(er), cell wall / walled	**or**	thin(ner), cell wall / walled **;**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>mucous gland cells / mucous gland(s) ; I mucosa
goblet cell(s) ;
list containing trachea and / or bronchus and / or bronchioles I and allow to two max
BUT if alveoli stated or incorrect cell types (e.g. ciliated cells) max 1</td><td>2</td></tr>
<tr><td>2(b)</td><td>any one from:

Golgi (body / complex / apparatus) ;
rough endoplasmic reticulum ; A rough ER / RER R SER I ER</td><td>1</td></tr>
<tr><td>2(c)</td><td>two marks to complete table
<table><tr><td>first process</td><td>transcription</td></tr><tr><td>second process</td><td>translation</td></tr><tr><td>third process</td><td>glycosylation</td></tr><tr><td>fourth process</td><td>exocytosis</td></tr></table>allow one mark if transcription first process and exocytosis last process but other two wrong way round
allow one mark if transcription and translation wrong way round and other two correct</td><td>2</td></tr>
<tr><td>2(d)</td><td>accept symbol Ψ for water potential
three from:
1 chloride presence outside cell causes water potential (outside cells) to, decrease / become more negative / become lower
or
chloride leaving cell causes water potential (in cell) to increase / AW ;
2 water potential gradient, created / present (between inside and outside of cell) ;
3 water leaves cell by osmosis (to be taken up by mucin to form mucus) ;
4 from higher to lower water potential / AW ; R if term gradient included</td><td>3</td></tr>
</table>

Question	Answer	Marks
2(e)	*any three from:* *to produce, new / daughter, cells…* **1** that are genetically identical **;** **2** to replace, old / damaged / dead, cells **; A** named cells **3** to repair (damaged / injured / diseased) tissue **;** **A** named tissue *if mp 2 and 3 not gained, allow 1 mark for replacing damaged tissue* **4** *ref.to* function **;** *in context* **5** AVP **;** *idea of* increase in number of cells / growth, to accommodate increase in size of gas exchange system in growing infants / AW	**3**

Question	Answer	Marks
3(a)	**C** =neutrophil **; A** polymorphonuclear leucocyte **A** basophil **A** eosinophil **D** = lymphocyte **;** B / T *is neutral* **E** = monocyte **; A** macrophage ***I*** *leucocyte / white blood cell, throughout*	**3**
3(b)(i)	*any two from:* lymphocytes / blood cells, produced in / originate from, bone marrow **;** *ref. to* stem cell(s) **;** *ref. to* cell division **;** e.g. bone marrow has cells that can carry out, mitosis / cell division **A** (stem cells are) multipotent	**2**

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Question	Answer	Marks
3(b)(ii)	*any three from:* *measles* immune response stimulated **;** detail **;** e.g. **either** antigen recognition / presence / binding **or** lymphocyte / white blood cell, stimulated / triggered **plus** clonal, expansion / proliferation / cell division / mitosis } **or** clonal selection / AW **R** incorrect pathogen name **R** bacteria *CLL* result of, uncontrolled mitosis **;** **A** uncontrolled, division / cell cycle **I** rapid mitosis detail **;** owing to, mutation / named mutation **or** cell cycle checkpoints not working **or** cells don't respond to signals to control division	**3**
3(c)(i)	*any two from:* (passive / simple) diffusion (of oxygen) across the phospholipid bilayer **;** **A** movement from a higher to a lower concentration *for diffusion* **A** between phospholipids / between fatty acid chains / across hydrophobic core / across bilayer / AW, *for phospholipid bilayer* small size **;** non-polar / uncharged **;**	**2**

Question	Answer	Marks
3(c)(ii)	*any three from:* less oxygen in inhaled air / AW **;** **A** less oxygen taken up from alveoli low(er) saturation of haemoglobin (with oxygen) **;** **A** Hb for haemoglobin **A** haemoglobin carries less oxygen *must be the context of oxygen* **R** saturation, with air / carbon dioxide haemoglobin has lower affinity for oxygen **;** (so) <u>more</u> haemoglobin required (so more red blood cells) / (more red blood cells) so <u>more</u> haemoglobin **;** AW compensation / compensates **;** **A** so same, volume / quantity / amount, of oxygen reaches body cells (compared to lower altitude)	**3**

Question	Answer	Marks
3(d)	*any four from:* **1** (alleles have) different nucleotide sequences **; A** different base sequences **2** base substitution / substitution of a base **; A** T replaced by A **3** (alleles have) different mRNA codons **; A** altered mRNA codon **R** altered genetic code **4** (results in) one amino acid change **or** change from, glutamic acid / glutamate / glu, to, valine / val **or** changed primary structure **; A** changed sequence of amino acids **R** *if implies whole sequence changes* **5** AVP **;** e.g. Hb^A = CTC and Hb^S = CAC (on template strand) **A** Hb^A = GAG and Hb^S = GTG (on non-template strand**)** **or** Hb^A = CTT and Hb^S = CAT (on template strand) **A** Hb^A = GAA and Hb^S = GTA (on non-template strand) *this is **not** also mp2* *ref. to* amino acid substitution at position 6 (*this is **not** also mp4*) **A** 6th, codon / triplet, changed **6** changed, (β-globin / Hb) tertiary structure **; A** polypeptide / (Hb molecule) quaternary structure **R** β-globin / polypeptide **7** *ref. to* loss of globular structure / hydrophobic amino acid faces outside (instead of towards centre) **;** **A** described e.g. (val) amino acid with hydrophobic R-group instead of (glu) amino acid with hydrophilic R-group *accept hydrophilic / polar, amino acid* *accept hydrophobic / non polar, amino acid*	**4**

Question	Answer	Marks
3(d)	**8** sticky (haemoglobin) molecule formed / forms fibres with other haemoglobin molecules **;** **9** oxygen taken up less easily / less oxygen carried by haemoglobin / AW **;** **A** β-globin takes up oxygen less easily / AW **10** AVP **;** (sickle cell) haemoglobin / β-globin, less soluble / AW **I** insoluble	

Question	Answer	Marks
4(a)	*max 3* if any membrane-bound organelles drawn inside cell e.g. nucleus, Golgi body, mitochondrion, lysosome, ER, a large vacuole BUT **I** vesicle / small vacuoles **I** detail of cell wall / cell surface membrane around flagellar area *four from:* cell wall **;** *must add another line to diagram* **R** cellulose cell wall cell (surface) membrane **; A** plasma membrane *label line to the inside of cell wall* **I** if outer line labelled as cell membrane DNA **;** **A** bacterial chromosome / nucleoid *as label* *allow one or two circular molecules* (*circle, loop, ball of string, tangled)* **R** *if obviously linear* **R** if label includes, histones / histone proteins / chromatin **R** if nuclear, envelope / membrane, shown **R** if nucleolus shown or labelled ribosomes **;** **R** 80S ribosomes *shown as, dots / small spheres* cytoplasm / cytosol **;** plasmid **;** *smaller than DNA, circular* AVP **;** e.g. 70S / smaller / 17–20 nm, *for ribosome* murein / peptidoglycan (for cell wall – allow even if cell wall label not added) pilus /pili *drawn as external hair-like structure(s)* basal granule *at base of flagellum* capsule drawn to outside *(some do have a capsule)*	**4**
4(b)(i)	0.8 % **; R** 0.80 %	**1**

Question	Answer	Marks
4(b)(ii)	*any two from:* delay in / no, diagnosis **;** delay in / no, treatment / therapy **;** **A** feature of, oral rehydration, treatment /solution **A** ORT / ORS e.g. lack of supply of ORT unwillingness by health workers to give ORT greater belief in herbal remedies thinking drug treatment is sufficient lack of clean water to make up ORT solution no rehydration programmes **I** improper treatment / treatment not effective *ref. to* no / lack of, antibiotic therapy **;** e.g. lack of supply of / less efficacious (AW) antibiotics used / less supervision in taking full dose *ref. to* antibiotic resistant strains **;** *idea that* already have a weak immune system / malnourished **;** **A** may have HIV/AIDS (hence weak immune system)	**2**
4(c)(i)	*any one from:* damaged sanitation system / poor sanitation following earthquake **;** **I** poor sanitation unqualified damage to, sewage treatment plants / water purification plants **;** AW (contaminated) sewage contaminates drinking water **; I** pollution **A** water becomes contaminated lack of purified drinking water**; A** lack of, clean / treated / safe / bottled, water AVP **;** no, proper / safe, disposal of sewage	**1**

Question	Answer	Marks
4(c)(ii)	*any three from:* **1** 2011, peak in / highest / AW, number of, cases / countries / countries and cases **;** **A** decrease, increase in 2011, decrease *for countries* **A** increase to 2011 and decrease *for cases* **2** (2010 outbreak in) *ref. to* Haiti and epidemic (so high number of 2011 cases) **;** **3** *ref. to* spread of disease to countries neighbouring Haiti (hence increase in countries in 2011) **;** **4** overall / generally / AW, decrease in number of countries with cases of cholera **or** 2008 54–56 countries and 2015 41–43 countries, with ref. to decrease **;** *decrease, peak at 2011 / increase in 2011, decrease is mp1 only* **5** suggestion for trend in decrease in number of countries **;** e.g. improved infrastructure for sewage / water treatment improved health education to prevent spread providing piped (treated) water **6** 2008–2010 number of cases increased and number of countries decreased **;** **7** AVP **;** e.g. lowest / AW, number of cases in 2013 **R** if also state that 2013 is lowest for countries similar number of countries in 2008 and 2011 but, approx 3× / much higher / stated values, number of cases in 2011	**3**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(a)</td><td>glycine in monomer column <u>only</u> ;

<table>
<tr><th>monomer</th><th>polymer</th><th>monosaccharide</th><th>polysaccharide</th></tr>
<tr><td>thymine
(nucleotide)
α-glucose
β-glucose } ;</td><td>cellulose
messenger RNA
glycogen
α-globin } ;

I glycine</td><td>β-glucose
α-glucose } ;

I glycine</td><td>cellulose
glycogen } ;

I glycine</td></tr>
</table>
I incorrect spellings
if α-globin appears once and is in monomer column instead of polymer column, and the monomer and polymer columns are otherwise correct, allow one mark (ecf)</td><td>5</td></tr>
<tr><td>5(b)</td><td>any three from:

allow points from an annotated diagram
1 phosphate head = hydrophilic / polar ;
2 fatty acid / hydrocarbon, tail / chains = hydrophobic / non-polar ;
if mps 1 and 2 not gained, allow one mark for, hydrophilic / polar, heads and, hydrophobic / non-polar, tails

3 (so) heads face, watery environment / tissue fluid / cytoplasm / cytosol / aqueous environment ;

4 (fatty acid) tails, form hydrophobic core / form area away from water / face each other / AW ;

5 ref. tails and hydrophobic interactions ;</td><td>3</td></tr>
</table>

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Question	Answer	Marks
6(a)(i)	*any two from:* correct ref. to time **;** correct ref. to volume of oxygen **; A** gas for oxygen **A** volume of water displaced by oxygen **A** measuring height of water level (decreasing) **A** cm^3 instead of volume AVP **;** subtract volume of gas displaced by H_2O_2 addition	**2**
6(a)(ii)	*any two from:* greater surface area (over which catalase released) **;** greater number of cells, damaged / cut open, to release catalase **;** higher concentration of, catalase / enzyme **; A** more, catalase / enzyme **A** more active sites available *must be linked to idea of more enzyme (i.e. must get mp 2 or 3)* so, higher rate of reaction / more enzyme-substrate complexes / more oxygen released **;** AW	**2**
6(b)	increase to optimum and steeper decrease **;** **A** if curve does not touch one or both axes	**1**

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