Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/21**

Paper 2 AS Level Structured Questions **October/November 2021**

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 2021 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.

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.

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Examples of how to apply the list rule: State three reasons … [3]

A

1. Correct	✓	**2**
2. Correct	✓	
3. Wrong	×	

B

(4 responses)

1. Correct, Correct	✓ ✓	**3**
2. Correct	✓	
3. Wrong	ignore	

C

(4 responses)

1. Correct	✓	**2**
2. Correct, Wrong	✓ ×	
3. Correct	ignore	

D

(4 responses)

1. Correct	✓	**2**
2. Correct, CON (of 2.)	× (discount 2)	
3. Correct	✓	

E

(4 responses)

1. Correct	✓	**3**
2. Correct	✓	
3. Correct, Wrong	✓	

F

(4 responses)

1. Correct	✓	**2**
2. Correct	✓	
3. Correct CON (of 3.)	× (discount 3)	

G

(5 responses)

1. Correct	✓	**3**
2. Correct	✓	
3. Correct Correct CON (of 4.)	✓ ignore ignore	

H

(4 responses)

1. Correct	✓	**2**
2. Correct	×	
3. CON (of 2.) Correct	(discount 2) ✓	

I

(4 responses)

1. Correct	✓	**2**
2. Correct	×	
3. Correct CON (of 2.)	✓ (discount 2)	

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;	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
mp	marking point

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Question	Answer	Marks
1(a)(i)	**X** nucleus **;** **Y** chloroplast **;** **Z** vacuole **;**	**3**
1(a)(ii)	*any **two** from:* no, large / permanent, vacuole / (temporary) small vacuoles **;** *this is in context of large permanent vacuole* no, chloroplast / chloroplasts **;** no cell wall **;** no plasmodesmata **;** glycogen granules **or** no, starch, granules / grains **;** nucleus, (more) central / AW **; A** nucleus not at, periphery / edge, of cell centrioles (present) **;** AVP **;** e.g. fewer Golgi bodies	**2**
1(b)(i)	iodine solution **; A** iodine in potassium iodide solution / I in KI solution (change in colour from) orange / brown, to, blue / black / purple **;**	**2**

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Question	Answer	Marks
1(b)(ii)	*any **four** from:* *similarities to max 3* polymers / polysaccharides / described **;** composed of α-glucose **;** (monomers joined by) glycosidic bonds **;** contain 1–4 (glycosidic) bonds / linkages **; A** glucosidic *differences to max 3* amylose molecules are unbranched / amylopectin molecules are branched **;** amylopectin molecules contain 1–6 (glycosidic) bonds **;** amylose helical **;** amylose is a smaller molecule **;** amylopectin is more compact **;**	**4**

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Question	Answer	Marks
2(a)(i)	red blood cell **;** **A** erythrocyte / red blood corpuscle	**1**
2(a)(ii)	*any valid difference one mark* *fluid **R** / tissue fluid, has,* *one from* fewer (named) proteins / no large proteins / no plasma proteins **;** **A** no named plasma proteins (albumen / fibrinogen) **A** fewer plasma proteins only if stated, they are small / leave the blood fewer / no, white blood cells **;** **A** more macrophages no red blood cells **;** no platelets **;** *explanation to match difference 2 marks* *(red blood cells, platelets, proteins, white blood cells)* too large **;** *(fewer white blood cells)* ref to some, white blood cells / phagocytes / macrophages monocytes, are able to move through **;** cannot be, filtered / fit, through gaps / AW, between endothelial cells / in endothelial wall / in capillary wall **;** idea that not filtered out under pressure from, plasma / blood **;** **or** *fluid **R** / tissue fluid, has* *one from* higher partial pressure / AW, of, carbon dioxide **;** **A** higher concentration / more *explanation to match difference 2 marks* produced by / waste of, (surrounding respiring) cells **;** **A** (waste) product of respiration diffuses / AW, from cells to, (fluid) **R** / tissue fluid (before entering blood) **;** idea that blood has come from lungs, where carbon dioxide has been excreted **;** AVP **;** e.g. diffusion through cells in capillary wall	**3**

Question	Answer	Marks
2(a)(ii)	**or** *fluid **R** / tissue fluid, has* *one from* lower partial pressure / AW, of, oxygen **;** **A** lower concentration / less *explanation to match difference 2 marks* carried by the blood (from the lungs) **;** **A** blood is more oxygenated diffuses / AW, from, red blood cells / **Q** / blood **;** idea that filtered out under pressure from, plasma / blood **;** AVP **;** e.g. diffusion through cells in capillary wall **or** *fluid **R** / tissue fluid, has* higher concentration of, glucose / amino acids / fatty acids **;** **A** more *explanation* carried by the blood to the respiring cells **;** small **;** can be, filtered / fit, through gaps / AW, between endothelial cells / in endothelial wall / in capillary wall **;** idea that filtered out under pressure from, plasma / blood **;** AVP **;** e.g. diffusion through cells in capillary wall	
2(b)(i)	bilayer drawn with heads pointed outwards and tails pointed inwards **;** phospholipid drawn with one (phosphate) head and two fatty acid tails **;**	**2**
2(b)(ii)	*any **one** from:* cholesterol, maintains / regulates, the fluidity of the membrane **;** **A** reduces fluidity at high temperature / increases the fluidity at low temperatures maintains / regulates, (mechanical) stability of the membrane / AW**;** prevents entry of hydrophilic substances / AW / ions **;**	**1**

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Question	Answer	Marks
2(c)(i)	*any **two** from:* increases heart rate **;** increases blood pressure **;** makes platelets stick together / makes blood more likely to clot **;** damage to, endothelium / endothelial wall / capillary wall **;** reduces blood flow to extremities / ref. vasoconstriction **;**	**2**
2(c)(ii)	*any **three** from:* *similarities max 2* both have a (co-)transport protein **;** both involve H^+ / hydrogen ions / protons **;** H^+ move down the concentration gradient / by facilitated diffusion **;** (sucrose and nicotine both) move against the concentration gradient **;** *differences max 2* in nicotine transport, H^+ ions and nicotine, move in opposite directions **;** **ora** for sucrose transport H^+ ions move from, the apoplast / cell wall, in sucrose transport (from the cytoplasm in nicotine transport) **;** AVP **;** e.g. ref to ATP	**3**

Question	Answer	Marks
3(a)	*one mark for infected person with contaminated faeces* faeces / sewage, contaminates, (drinking) water / cooking utensils / vegetable plots / crops / food **;** *one mark for uninfected person* drinking contaminated water / eating food washed in contaminated water **;** **R** infected food or water **;** **A** faecal-oral route *for two marks*	**2**
3(b)	*any **three** from:* secondary structure **;** alpha / α, helix **;** *bonding* hydrogen bonding **;** further detail **;** e.g. between NH and CO of different amino acids four, amino acids / places, ahead hydrogen of the NH and oxygen of the CO	**3**
3(c)(i)	*any **two** from:* break down / digest / hydrolyse / AW, pathogen / foreign material / AW **;** *ref. to* containing hydrolytic / digestive / named, enzymes **;** **A** hydrolases fuse with the, phagosome / phagocytic vacuole / AW **;**	**2**
3(c)(ii)	*any **two** from:* cells are dead so cannot, cause disease / reproduce / AW **;** only part of a choleragen molecule, so no toxic effect ; recognised by / trigger clonal selection of, more than one type of B-lymphocyte **;** stimulates production of different antibodies **;** stimulates the production of more than one type of memory cell / AW **;** *ref. to* immune system cells can respond to bacterial cells and the toxin produced **;** AVP **;** e.g. different antigens on the surface of the cells	**2**

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Question	Answer	Marks
3(d)	*any **four** from:* (resistant) (*Vibrio cholerae*)is not killed by the antibiotic **;** **A** can still reproduce inability to treat people with cholera using antibiotics **;** prolonged periods of illness **;** (so) increased risk of spread / AW **;** increased death rate from cholera **;** transfer of antibiotic resistance (alleles) to, other species of bacteria / other strains of *V.cholerae* **;** development of multiple resistance in other species of bacteria **;** inability to treat other bacterial diseases **;** increased death rate from other bacterial diseases **;** need to research alternative antibiotics **;** AVP ;	**4**

Question	Answer	Marks
4(a)(i)	*any **two** from:* microtubules / spindle (fibres), are attached to, centromere / kinetochore **;** (spindle) fibres, contract / shorten / retract **; A** microtubules disassemble / AW move / pull, (sister) chromatids / (daughter) chromosomes, to opposite poles **;**	**2**
4(a)(ii)	deoxyribose <u>and</u> phosphate <u>and</u> base **;** *further detail* *one from* diagram / description, of phosphate group and base attached to deoxyribose **;** one correctly named base or A,T C and G **;**	**2**
4(b)(i)	*any **two** from:* allow DNA replication to continue **;** *idea that* stem cell to, self renew / keep dividing **;** *idea that* stem cells differentiate into (named) specialised cells **;** *idea that* mitosis produces cells for, cell replacement / tissue repair **;** (maintains telomeres, so) prevents the loss of genes **;**	**2**

Question	Answer	Marks
4(b)(ii)	*any **one** from:* (high level of telomerase activity) allows ,continuous / uncontrolled, mitosis / cell division **;** idea of allowing shorter cell cycle **;**	**1**
4(b)(iii)	*any **three** from:* DNA binds to (complementary section of) mRNA / hydrogen bonds form between the complementary bases (of DNA and RNA) **;** mRNA cannot bind to the ribosome **;** ribosome cannot, move along the mRNA **;** consequence e.g. no sites for tRNA to bind **/** tRNA cannot bring attached amino acid **;** tRNA anticodons cannot form hydrogen bonds with mRNA codons **;** AVP **;** e.g. *idea that* DNA enters nucleus to bind and mRNA then too large to leave via nuclear pores	**3**

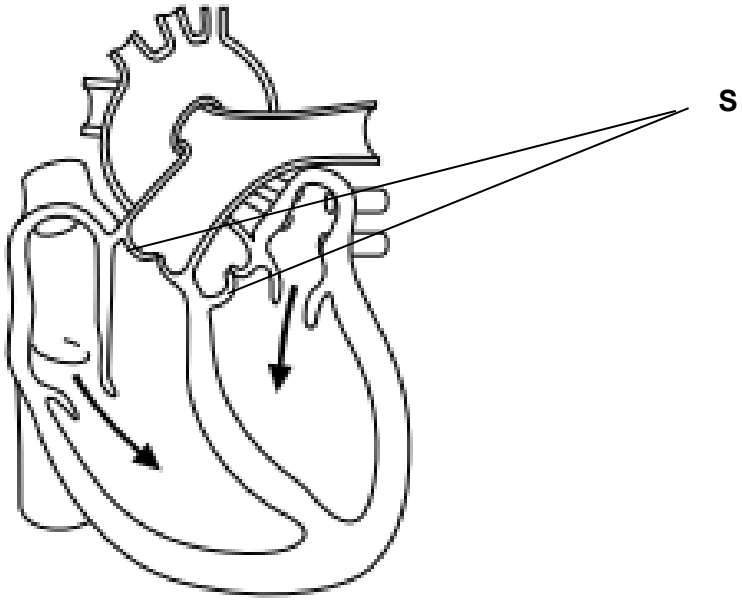
Question	Answer	Marks
5(a)	*in context of from a plant* loss of water vapour **;** **I** evaporation unqualified from, the aerial parts / leaves **;**	**2**
5(b)	1.2 (mm min^{-1}) **;**	**1**
5(c)	*any **two** from:* humid air / water vapour, moves away from the leaves **;** water potential gradient is steeper **;** higher rate of evaporation into the air spaces in the leaf **;**	**2**

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Question	Answer	Marks
5(d)	*any **four** from:* movement by, cohesion-tension **;** cohesion / hydrogen bonds, between water molecules **;** **A** cohesive force (water moves as an) unbroken column / AW **;** transpiration pull **or** column of water, under tension / pulled up **;** *ref. to* adhesion of water molecules to, cellulose / lining / walls (xylem vessels) **;** **A** adhesive force *ref. to* hydrophilic / polar, property of cellulose (fibres) **;** **A** hydrophilic / polar, parts of lignin *ref. to* water potential **;** e.g. (evaporation results in) lower water potential at the top of the xylem vessel (water moves) down a water potential gradient / from a region of high water potential to a region of lower water potential	**4**

Question	Answer	Marks
6(a)	atrial systole **;** **A** atrial contraction *and **one** from:* volume of the atria is small(er) than in **A** **;** **A** atria in stage **B** are smaller than those in stage **A** the atrioventricular / bicuspid and tricuspid, valves are open (and semilunar valves are closed) **;** the blood is flowing (from the atria) into the ventricles **;** *if name of stage is incorrect accept correct description of atrial systole, no ecf for incorrectly named stage*	**2**

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Question	Answer	Marks
6(b)(i)	label line to any part of a semilunar valve **;**  	**1**
6(b)(ii)	prevent blood flowing backwards **;** from the (named) arteries to the (named) ventricles **;** **or** ensure blood flows in one direction **;** from the (named) ventricles to the arteries **;**	**2**

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