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**

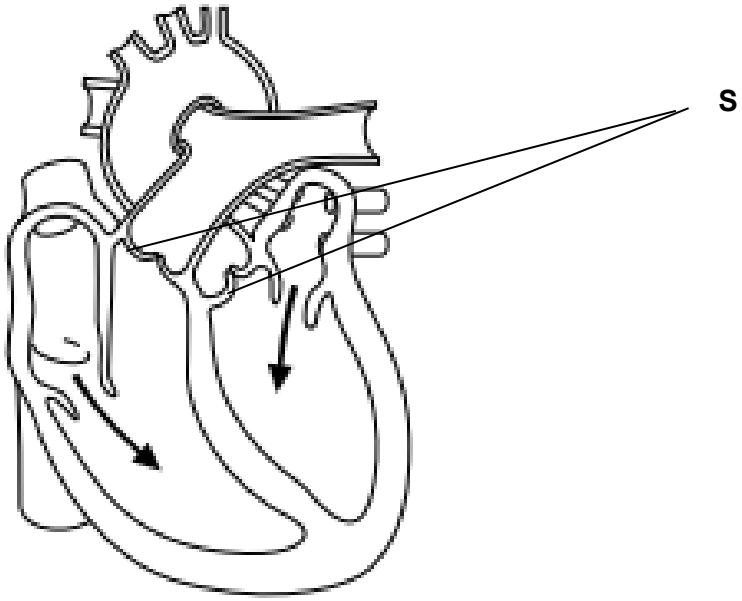
Question	Answer	Marks
5(a)	*in context of from a plant* loss of water vapour **;** **I** evaporation unqualified from, the aerial parts / leaves **;**	**2**
5(b)	1.2 (mm min^{-1}) **;**	**1**
5(c)	*any **two** from:* humid air / water vapour, moves away from the leaves **;** water potential gradient 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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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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A	accept
I	ignore
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>one mark max for each feature
<table>
<tr><th>feature common to bacterial and plant cells</th><th>bacterial cell</th><th>plant cell</th></tr>
<tr><td>cell surface membrane</td><td>contain hopanoids</td><td>contains cholesterol</td></tr>
<tr><td>ribosome</td><td>70S / smaller / 18-20nm
I no 80S ribosomes</td><td>80S / larger / 22-30nm ;
A and 70S</td></tr>
<tr><td rowspan="3">DNA
max 1 mark
must be across the dotted rows</td><td>circular / closed loop
I ref. to plasmids</td><td>linear ; AW</td></tr>
<tr><td>naked A no histones</td><td>(complexed) with, histones / (basic) proteins ;</td></tr>
<tr><td>free in, cytoplasm / cytosol
A not enclosed / AW, by nuclear envelope
A found in nucleoid region</td><td>enclosed by / AW, nuclear envelope ;

A in a nucleus</td></tr>
<tr><td>cell wall</td><td>(mainly composed of) peptidoglycan / murein</td><td>(mainly composed of) cellulose ;</td></tr>
</table></td><td>3</td></tr>
</table>

Question	Answer	Marks
1(b)	*any **three** from:* **A** particles *for substances* **I** *ref. to* size **1** for transport of ions <u>and</u>, hydrophilic / polar, molecules / substances AW **or** for transport of substances that cannot pass (directly) across the (phospholipid) bilayer / hydrophobic core **;** AW **R** if implied that all substances cannot cross the bilayer **I** substances, bypass / do not need, to cross the bilayer **2** carrier proteins for active transport and facilitated diffusion <u>and</u> channel proteins for facilitated diffusion **;** **3** further detail carrier protein **; I** water-filled / hydrophilic interior e.g. have specific binding sites are specific in, molecule / ion / named example, transported AW carry out conformational change (following binding) / AW use, ATP / energy active transport) moves substances against the concentration gradient / AW (active transport) moves substances down the concentration gradient / AW (facilitated diffusion) *accept once in mp3 or 4* **I** moves substances by diffusion **4** further detail channel protein **;** e.g. hydrophilic / water-filled, pore / channel **A** hydrophilic lining some, ion channels / proteins channels for ions, are selective (for size and charge) (most) channel proteins are not selective aquaporins for passage of (larger quantities of) water some, are gated / voltage-gated moves substances down the concentration gradient / AW	**3**

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Question	Answer	Marks
1(c)	**I** *ref. to* light absorption *any **one** from:* *chloroplasts at periphery because* pushed by vacuole **;** vacuole is, turgid / filled with cell sap **;** (large permanent) vacuole is in the centre (of the cell) **;**	**1**
1(d)	metaphase label to metaphase cell **;** prophase label to one of the prophase cells **;**	**2**

Question	Answer	Marks
2(a)	too large / large size **; A** not small enough cannot pass through endothelial, pores / gaps **I** holes **A** fenestrations / AW **or** cannot, pass across / cross the membranes of, endothelial cells **;** **A** epithelial cells *in context of entering an endothelial cell and exiting to the tissue fluid*	**2**
2(b)	biuret (solution / reagent) **;** **A** copper sulfate solution and, sodium / potassium, hydroxide (change from light) blue to, lilac / purple / violet / mauve **;**	**2**

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Question	Answer	Marks
2(c)	*accept Hb / hb for haemoglobin* *any **three** from:* **1** (at altitude) lower, partial pressure of oxygen / pO_2 (in, atmosphere / inhaled air / inspired air / alveolar air) **;** **I** low pO_2 in blood **R** if stated as high $ppCO_2$ and low pp O_2 **R** low, volume / saturation, of oxygen **2** percentage saturation of haemoglobin (with oxygen), lower / decreased **;** **A** haemoglobin is less saturated **A** fewer molecules of / less, oxygen, combine / associate, with haemoglobin **I** absorbed / taken up by **R** if in context of Bohr effect but then allow ecf for overall **max 2** **3** (as) haemoglobin has lower affinity for oxygen (than at sea level) **;** **4** more haemoglobin (synthesised / required / provided) **;** **5** compensation / described **;** e.g. helps to transport the same quantity of oxygen as at sea level **6** AVP **;** e.g. *idea of* more rbc through pulmonary capillaries per unit time *ref. to* EPO / erythropoietin (secreted to increase red blood cell production)	**3**

Question	Answer	Marks
2(d)	*any **three** from:* **A** Ψ for water potential **A** plasma for blood *mp1 and mp2 = consequence in blood of lower blood albumin than normal* **1** *idea that* low blood albumin means, less / AW, solute **;** **2** (so) higher water potential (in blood)**;** *must be in context of blood context can be anywhere along the capillary* **A** high water potential *if ref. to low albumin is made* **A** steeper water potential gradient (than normally, at arterial end) *mp3 and mp4 = return of water to blood from tissue fluid (capillary venous end)* **3** less steep water potential gradient (than normal) / little difference in water potentials **;** **4** less / little, water returns to, blood / capillary (from tissue fluid) **;** **A** (tissue) fluid *for water* **R** plasma *for water* *additional ideas* **5** *idea that* more, water / plasma / fluid, enters tissue fluid (than normal) **R** tissue fluid *for fluid* **A** more, water / fluid, enters tissue fluid than exits (to the capillary or lymph system) **;** *(compared to normal)* **6** AVP **;** e.g. water can enter tissue fluid for a longer time than normal less albumin than normal to act as an osmotic force for return of water / AW too much excess, water / fluid / tissue fluid, to be taken up into lymph, capillaries / vessels / system	**3**
2(e)	(cell surface) receptor(s) **;**	**1**

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Question	Answer	Marks
3(a)	*any **two** from:* *infectious* (baculovirus) is a pathogen / causative organism (of disease) **;** (baculovirus) is transmitted (from one insect host to another) / transmissible **;** *allow a description of transmission, e.g. transfer of, virus / pathogen, from, insect to insect / organism to organism* **I** spread **R** person to person / plant to plant *disease* *idea of* causing ill-effect on insect, e.g. causes, harm / damage / loss of functioning / ill health / death **; A** illness	**2**
3(b)	*any **two** from:* (highly) alkaline / acidic (conditions) **; A** (very) low / high, pH disruption of, hydrogen / ionic, bonds, of (polyhedron) proteins / polyhedrins **;** (presence of) digestive enzymes / hydrolytic enzymes / hydrolases **;** **R** if stated as within lysosomes *but allow detail of enzyme action ecf* detail **;** e.g. extracellular enzymes / proteases / peptidases peptide bonds broken **A** amide bond for peptide bond optimum pH **;** *must be in context of enzyme presence*	**2**

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Question	Answer	Marks
3(c)	if detail is linked to incorrect level of structure or levels of structure not named, **max 3** **1** primary structure detail **;** e.g. sequence of amino acids / ref. to sequence in Fig 3.1 (many) amino acids joined by peptide bonds **2** secondary structure detail **;** e.g. has, α / alpha, helices has β / beta, pleated sheets **A** β / beta, pleats has areas of random coils / AW **3** tertiary structure detail **;** e.g. interactions between, side chains / R groups (R group interactions are) H bonds, ionic bonds, hydrophobic interactions, disulfide bridges *any two* folding and coiling *in context of polypeptide chain* **4** quaternary structure detail**;** e.g. <u>three</u> (identical) polypeptide chains ref. to interaction of polypeptide chains **A** polypeptides *for polypeptide chains*	**4**
3(d)	*any **three** from:* *ref. to* <u>genetic code</u> **;** *in correct context* amino acids coded for by more than one codon / two or more codons for (most) amino acids **;** **A** triplet (of, bases / nucleotides) 64 codons and 20 amino acids **;** third base in codon can be different / only first two bases in codon are same **;** AVP **;** *idea that* amino acid sequence is only the result of exons / gives information only about introns only sure of sequence for, two amino acids / met and trp <u>degenerate</u> code / degeneracy of code **R** degenerative *ref. to* control sequences STOP codons (also) have more than one triplet (of bases) STOP codons do not specify amino acids	**3**

Question	Answer	Marks
4(a)	cohesion **;** adhesion **;**	**2**
4(b)(i)	*any **two** from:* **1** higher rate of transpiration during the day / lower rate of transpiration during the night / AW **;** **A** flow of xylem sap *for transpiration* **2** stomata are open during the day **; ora** *must be in context of transpiration* *if mp1 and mp2 not gained, allow one mark for idea that results are related to pattern of, light / daylight / day, and, dark / night (use an ordinary tick)* **3** *idea that* all three vines were kept in the same conditions so a changed condition that affects transpiration will affect all three **;** **A** all three vines have the same external factors acting that affect transpiration **4** AVP **;** e.g. (during daylight) stomata open, to obtain carbon dioxide / for photosynthesis *idea that,* increasing / decreasing, rate is related to degree of opening of stomata varying with light intensity	**2**

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Question	Answer	Marks
4(b)(ii)	*allow (xylem sap) flow rate for rate of transpiration* *any **two** from:* **1** the greater the (total) area of leaf, the higher the rate of transpiration **; ora** **A** grapevine 1 has largest leaf area and highest rate of transpiration *accept other comparisons* **R** *ref. to* SA:V but allow ecf in mp2 **2** the greater the (total) area of leaf, the more stomata are present **;** AW **A** more leaves means more stomata **3** detail of any one grapevine **;** e.g. grapevine 1 = highest transpiration rate and, highest number of / most, stomata grapevine 3 = lowest transpiration rate and, lowest number of / least, stomata *allow use of comparative data to support mp* *(if detail includes ref. to (total) leaf area then check to see if mp2 can also be awarded)* **4** *ref. to* relationship between (total) internal surface area and (total) leaf area **;** e.g. larger leaf surface area means internal surface area increased **5** *ref. to* relationship between internal surface areas and rates of evaporation **;** **6** AVP **;** higher rate of flow of xylem sap for largest leaf area as (overall) more water used in metabolism AW **ora** (greater area so) more leaves so more xylem vessels **ora**	**2**
4(b)(iii)	overcast / cloudy / rain / shade / AW **;** **A** lower wind speed / temperature **A** higher humidity **R** if described as stomata close (transpiration is still occurring)	**1**

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Question	Answer	Marks
4(b)(iv)	*valid method e.g.* draw around / place, leaf on, squared paper / graph paper / grids **;** **A** square ruler count number of (full) squares **; R** multiply by two / do it on other side method for part squares **;** e.g. add up all part squares and divide by 2 match a larger part square with a smaller and count as one square use graph paper with larger and smaller squares **or** photocopy leaves, cut out and weigh (cut out) **;** divide mass by mass of 1 cm^3 of same paper **;** **or** *ref. to* using an App **;** further detail **;** e.g. place leaf, flat / on white surface **;** take photo of single leaf with smart phone / AW	**2**

Question	Answer	Marks
5(a)	*ignore single letters for the bases* **A** *purines* = adenine and guanine **;** *in either order* *pyrimidines* = cytosine and uracil **;** *in either order* **B** phosphodiester (bond) **;** **C** ribose **;**	**4**
5(b)	*any **three** from: penalise once if incorrect, pathogen / type of organism* aerosol infection / droplet infection / ref. to airborne droplets **;** *in context of droplets containing, pathogen / virus* infected person, exhales / expires / breathes out / coughs / sneezes / AW, (airborne droplets) **;** (airborne droplets) breathed in / AW, by, uninfected / healthy, person**;** *idea of* transmitted when uninfected person touches an infected surface and puts fingers into, mouth / nose **;** **R** contact *without qualification*	**3**

Question	Answer	Marks
5(c)(i)	trachea bronchus / bronchi bronchiole / bronchioles **;** **A** types of bronchiole	**1**
5(c)(ii)	**A** CO *for carbon monoxide* **A** Hb / hb, *for haemoglobin* *any **two** from* **1** forms carboxyhaemoglobin **;** **A** binds to haemoglobin (permanently) **2** less haemoglobin available to bind oxygen / haemoglobin has higher affinity for carbon monoxide (than for oxygen) **;** **3** reduces, percentage saturation of haemoglobin (with oxygen) / AW **;** **A** less, oxygen binds to haemoglobin / oxyhaemoglobin forms **I** prevents oxygen binding *if mp2 and mp3 not gained allow one mark for statements such as* *reduces capacity for binding of oxygen to hb / less oxygen carried by hb / decreases the oxygen carrying capacity of hb* **4** decreased quantity of oxygen transported / AW **;** **5** damages, endothelium / tunica intima / lining of blood vessels **;**	**2**
5(d)(i)	(steady) increase in number of (estimated) deaths (from measles, over time / from 2000 to 2017) **;** **A** (relatively) constant then (steady) increase in number of (estimated deaths over time)	**1**

Question	Answer	Marks
5(d)(ii)	*any **three** from*: **I** ref. to cost or mutations **1** as (global) population increased, higher, number / proportion, of unvaccinated **; ora** **2** *ref. to* HIV link to measles **;** e.g. increase in number of people living with HIV increases spread of measles increase in cases of HIV / AIDS, measles can be an opportunistic disease **R** spread of HIV / AIDS weakened immune system in people with HIV / AIDS so measles more likely to occur (in unvaccinated) **3** less / no, herd immunity (so increased chance of getting measles) **;** **A** *ref. to* larger, number / proportion, unvaccinated will increase risk of spreading disease *context is community* **4** one example of a difference between unvaccinated versus vaccinated **;** e.g. risk of <u>death</u> from measles is higher in unvaccinated unvaccinated do not have, (artificial active) immunity / memory cells *context is individuals* **5** suggestion as to why fewer people are vaccinated **;** e.g. reluctance, of parents to get child vaccinated reluctance because of, cultural / religious, beliefs difficulty in obtaining vaccine *in context of remote communities* collapse of vaccination programmes in some countries / AW lack of, trained trained professionals / health facilities, to deliver vaccine lack of education about benefits of vaccine / AW **6** suggestion as to why measles cases (and so deaths) may increase **;** e.g. (greater proportion of people) malnourished / lack vitamin A (greater proportion of people) living in, overcrowded / poor, conditions **I** overcrowded countries measles is easily spread (with increase in population) **A** very infectious measles is more easily spread in overcrowded conditions	**3**

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Question	Answer	Marks
5(d)(ii)	**7** example of spread (of measles) owing to movement of people between countries **;** e.g. (unvaccinated) people with measles arriving to a country and spreading disease unvaccinated people travelling to countries with the disease, catching measles and taking it back home people arriving with measles to countries with low vaccination rates **8** AVP **;** e.g. ref. to, no / any specific difficulty for, contact tracing lack of, isolation / quarantining poor epidemiological records so authorities cannot react to outbreaks improved, recording / reporting, of deaths over the time period	
5(e)	*any **two** from:* (high count owing to), cancerous / uncontrolled mitosis of, white blood cells **;** **A** malignant cells **A** uncontrolled division white blood cells (in child with leukaemia) cannot, function (in immunity) / protect / example of function **;** **A** undifferentiated / unspecialised (so) weakened immune system (and more likely of developing measles) **;** AW vaccination is, less effective / not effective / gives weak immune response **;** secondary immune response, does not occur / too slow (after vaccination) **;** AVP **;** has memory cells but clonal expansion, does not occur / is faulty	**2**

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Question	Answer	Marks
6(a)	**1** (open top tap and) keep bottom tap closed / close bottom tap for a longer time (and then open bottom tap to collect product) **A** close bottom tap for complete hydrolysis to occur **or** run starch solution through column, collect product, repeat (a number of times) / AW **or** only allow a small quantity of starch solution through at a time / AW **;** *if a different idea suggested to set-up in Fig. 6.1, method must be related to an increase in contact time between beads and starch to award mp1* *any **two** from:* **2** suggestion of modification to experimental set-up in Fig. 6.1 **;** e.g. use smaller beads use more, beads / enzyme in beads **I** use more immobilised enzyme use of visking tubing attached to end of column (so only reducing sugar passes out) use longer, narrower column **I** *ref. to* filtering with filter paper / adding buffers to control pH **3** test (sample of) product with iodine solution, qualified **;** **A** iodine in potassium iodide solution / I in KI solution e.g. to confirm no starch present stays orange (colour) does not change to blue-black (colour) to confirm no starch present **4** ref. to using optimum temperature (for amylase) **; A** e.g. 35 °C temperature	**3**

Question	Answer	Marks
6(b)	*any **one** from:* surface area to volume ratio / SA:V, decreases with increasing size / increases with decreasing size **;** SA:V ratio is different, with consequence **;** e.g. smaller beads means increased contact of substrate with enzyme (in same conditions) *idea that overall,* larger surface area exposed using smaller beads **; ora** *(for the same experimental set up)* larger beads, slows rate of diffusion into beads / increases diffusion time to reach enzyme **; ora** larger beads will increase rate of flow through column **; ora**	**1**

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Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/23**

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.

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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.

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
mp	marking point

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Question	Answer	Marks
1(a)(i)	translation **;**	**1**
1(a)(ii)	**A** – messenger RNA / mRNA **;** **B** – transfer RNA / tRNA **;** **C** – (poly)peptide (chain) **;** **I** PPC / (primary structure of) protein / amino acid chain	**3**
1(a)(iii)	*accept names of bases* **D** – AAA **E** – GUG **;**	**1**

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Question	Answer	Marks
1(b)	*any **four** from:* *structure to max three* *ignore all refs to DNA and red blood cells* 1 different amino acid will have different, R group / side chain **;** **A** glutamic acid / glu, to, valine / val 2 may prevent formation of bond(s) between R groups **;** 3 may form, new / different, bond(s) between R groups **;** 4 change in, secondary / 2° / tertiary / 3° / quaternary / 4°, structure **;** **A** change in, globular shape / 3D shape **A** different folding of, β-globin / polypeptide / haemoglobin **R** quaternary if referring to, a single polypeptide / β-globin 5 any further detail on, 2° / 3° / 4°, structure **;** e.g. interactions between α-globin and β-globin may change / AW 6 AVP **;** e.g. change from, polar / charged / hydrophilic, to, non-polar / non-charged / hydrophobic (R group / amino acid) *function* 7 change in ability, to bind / AW, to oxygen / carbon dioxide **;** **A** lower / higher for change **A** change in percentage saturation of haemoglobin with oxygen **A** change in affinity for, oxygen / carbon dioxide **A** changes the volume of, oxygen / carbon dioxide, carried **A** carry, more / less, oxygen / carbon dioxide **R** if haemoglobin is said to have an active site	**4**

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Question	Answer	Marks
2(a)	*any **two** from:* anything within range 0.6 to 0.8 **;** μmol dm^{-3} min^{-1} / μmol per dm^3 per min **;** **A** μmol per dm^3 / min *or* μmol dm^{-3} / min	**2**
2(b)(i)	*ignore any explanation* *any **two** from:* 1 initial rate will be, lower / slower **;** 2 takes longer to reach the, plateau / end concentration / 10 μmol dm^{-3} **;** **A** longer to complete the reaction / maximum concentration 3 *idea that* the final / end, concentration of product will be, the same / 10 μmol dm^{-3} **;** **I** refs to the shape of the graph	**2**
2(b)(ii)	*ignore any explanation* *any **two** from:* 1 initial rate will be, higher / faster **;** 2 shorter time to reach, / plateau / end concentration / 10 μmol dm^{-3} **;** **A** shorter time to complete the reaction / maximum concentration 3 *idea that* the final / end, concentration of product will be, the same / 10 μmol dm^{-3} **;** **I** *ref. to* the shape of the graph	**2**

Question	Answer	Marks
2(c)	*any **two** from:* 1 allows a (valid) comparison of the, activities / AW, of the enzymes **;** 2 initial rate is the fastest rate **;** 3 *idea that* if rate is calculated over a longer period of time than the linear part of the curve the rate will vary **;** 4 not limited by substrate concentration / substrate is in excess **;** **A** 'no limiting factors' if substrate not mentioned 5 not influenced by (increase in concentration of) product **;**	**2**

Question	Answer	Marks
3(a)(i)	*any **three** from:* 1 no, nucleus / organelles **; ora** e.g. 'if they were white blood cells …' 2 cytoplasm is, homogeneous / AW **;** 3 about same, size / width / diameter, as lumen of capillary **;** 4 cells about 7 μm in diameter / AW **;** 5 flexible / variety of shapes / irregular shapes **;** 6 AVP **;** e.g. rouleau	**3**

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Question	Answer	Marks
3(a)(ii)	*assume answers are about tissue fluid unless told otherwise* *any **two** from:* 1 no red blood cells **;** 2 no platelets **;** 3 fewer (named) protein(s) / no large proteins / no plasma proteins **;** **A** no named plasma proteins (albumen / fibrinogen) **A** fewer plasma proteins only if stated that they are, small / leave blood 4 less, glucose / amino acids / fatty acids **;** 5 fewer, white blood cells / leucocytes / neutrophils / monocytes **;** **A** more macrophages **6** less / lower concentration of, oxygen **or** more / higher concentration of, carbon dioxide **;** **I** urea except in liver and muscle tissue **R** 'waste'	**2**
3(b)(i)	*ignore any explanations* (mean) percentage saturation of haemoglobin with oxygen (in blood leaving the lungs) decreases **;** (mean) haemoglobin concentration in blood increases **;** any suitable comparative data quote with altitude in m and mean Hb concentration in g 100 cm^{-3} ***or*** percentage saturation **;**	**3**

Question	Answer	Marks
3(b)(ii)	*any **three** from:* 1 more red blood cells **;** 2 larger red blood cells **;** 3 more haemoglobin per red blood cell **;** 4 more alveoli / larger surface area for gas exchange **;** **A** bigger lungs / larger chest volume / broader chest / larger capacity of lungs (total or vital) 5 higher, cardiac output / stroke volume / AW **;** **A** higher blood pressure in pulmonary artery 6 AVP **;** 7 AVP **;** e.g. higher tidal volume / deeper breaths higher ventilation rate (minute volume) **I** faster breathing *ref. to* erythropoietin / EPO, stimulating production of (more) red blood cells more red blood cells through alveolar capillaries per unit time	**3**

Question	Answer	Marks
4(a)	*any **two** from:* *cellulose molecules* 1 straight (chains) / linear / unbranched **;** 2 arranged in parallel **;** 3 hydrogen bonds between (cellulose) molecules **;** 4 any detail, e.g. between H of –OH groups and –O of –OH groups **;** **A** between -OH groups 5 AVP **;** e.g. cellulose molecules have, staggered / overlapping, ends **I** overlapping microfibrils	**2**
4(b)(i)	*any **three** from:* 1 two layers of phospholipid **;** 2 label for, phospholipids / phospholipid bilayer **;** 3 channel protein across whole bilayer with <u>hole through middle</u> + label **;** ecf if a monolayer shown or no phospholipids drawn 4 any additional feature + label **;** e.g. hydrophilic heads / hydrophobic tails / cholesterol / other named protein (e.g. glycoprotein)	**3**

Question	Answer	Marks
4(b)(ii)	*any **two** from:* 1 to allow facilitated diffusion **;** **R** active transport 2 ions are, charged / hydrophilic **;** 3 cannot pass through, hydrophobic core / phospholipid bilayer **;** **A** ora – channel proteins provide a, hydrophilic / water-filled, pathway (through the membrane) / AW **A** channel proteins are lined by polar R groups **A** ions are repelled by, hydrophobic core / phospholipid bilayer	**2**
4(c)	*any **three** from:* 1 transpiration (rate), will not decrease to a low level / remains the same (if conditions remain the same) / remain the same at night / increases if (named) condition(s) change / AW **;** 2 water vapour continues to diffuse out (from intercellular air spaces) **;** 3 (because) stomata, cannot close / remain open **;** 4 guard cells do not lose turgidity **;** 5 because no outward flow of water (from guard cells) **;** 6 by osmosis / down water potential gradient (from guard cells) **;** 7 AVP **;** e.g. *ref. to* more likely to wilt rates of gaseous exchange remain the same	**3**

Question	Answer	Marks
5(a)(i)	Morbillivirus **;**	**1**
5(a)(ii)	*any **three** from:* 1 (pathogen is transmitted) in airborne droplets / as an aerosol **;** **A** droplet infection / aerosol infection 2 breathed / sneezed / coughed / AW, out by infected person **;** 3 (droplets) breathed in by, healthy / uninfected, person **;** 4 touching surface with virus and, breathing into lungs / puts fingers in, nose / mouth **;**	**3**
5(b)	*any **three** from:* 1 increase and decrease / fluctuates / AW **;** **A** between 2015 and 2019, over some of the years or just one year **A** increase, decrease and then increase for any one year 2015 to 2018 2 use of data to support mp1 **;** 3 numbers for January 2019 are, highest / higher than other years **or** numbers for March 2019 are, lowest / lower than other years **;** 4 use of data to support mp3 **;**	**3**

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Question	Answer	Marks
5(c)	*ignore* mutation and vaccine evasion / vaccine resistance *ignore refs to cost* *any **four** from:* *transmission and susceptibility (from mp1 to mp7)* 1 infected person can infect many people / spreads easily in crowded conditions ; 2 measles spreads to children before they are vaccinated ; 3 vaccine cannot be given soon after birth because of passive immunity ; 4 immunisation rates do not reach 100% / ref to difficulty in reaching herd immunity / herd immunity is not achieved ; 5 herd immunity needed for protection of, unvaccinated people / babies ; 6 some people have, no / poor, response to vaccine ; **A** vaccine not always effective 7 *ref. to* malnutrition / *ref. to* lack of vitamin A ; *reasons for low immunisation rates (from mp8 to mp12)* 8 difficult to reach all people, with example ; e.g. in rural areas areas of poor housing in big cities 9 collapse of vaccination programmes as a result of war / AW ; 10 lack of, trained professionals / health facilities ; 11 many children do not receive boosters ; 12 reluctance to be vaccinated / *ref. to* anti-vaccination campaigns / ref to MMR *or* triple vaccine / lack of awareness about beneficial effects of vaccine / *ref. to* cultural *or* religious reasons / AW ; 13 AVP ; *(for either section of the answer)* e.g. *ref. to* any specific difficulty with contact tracing *ref. to* thermostability of vaccine and maintaining a cold chain migrants, with measles / from an area with an outbreak of measles	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)</td><td>
<table>
<tr><th>feature</th><th>DNA</th><th>collagen</th></tr>
<tr><td>elements</td><td>C H O N P ;</td><td>CHON</td></tr>
<tr><td>monomers</td><td>(DNA) nucleotide(s) ;</td><td>amino acid(s) ;
ignore any named amino acid</td></tr>
<tr><td>bonds between monomers</td><td>phosphodiester ;</td><td>peptide ;</td></tr>
<tr><td>site of production in eukaryotic cells</td><td>nucleus</td><td>ribosomes / rough endoplasmic reticulum / RER / rough ER ;

A cytoplasm / Golgi (body / apparatus / complex)</td></tr>
</table>
</td><td>6</td></tr>
<tr><td>6(b)</td><td>*any **two** from:*

1 two membranes forming, nuclear envelope ;
A nuclear envelope is composed of a double membrane

2 nuclear pores too small to allow DNA to, pass through / escape ;
A ora

3 AVP ;
e.g. prevents DNA from being broken down (by enzymes)
I DNA damage by enzymes

protects DNA from hydrolytic enzymes
idea of nuclear envelope is a barrier, between / that separates, nucleus and, cytoplasm / rest of cell</td><td>2</td></tr>
</table>

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Question	Answer	Marks
6(c)	*any **two** from:* *either* 1 allow alveoli, to stretch and recoil (during inhalation and exhalation) **or** allow, lung (tissue) / named airway, to expand and recoil **;** **I** 'contract', 'relax' and 'gas exchange' / 'respiration' 2 prevent alveoli, over-stretching / bursting **;** 3 recoils to move air out of alveoli **;** **A** force / expel / push / AW **A** alveolar duct	**2**
6(d)	interphase / S (phase) / synthesis (phase) **;** **A** S1 / S2 **R** if 'interphase + G1 / G2' or 'S + G1 / G2'	**1**