



Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

Biology**9700/22**

AS Structured questions

March 2023Maximum Mark: 60

PRE-STANDARDISATION

Cambridge Assessment International Education – Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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	<p><u>'List rule' guidance</u> (see examples below)</p> <p>For questions that require <i>n</i> responses (e.g. State two reasons ...):</p> <ul style="list-style-type: none"> • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>. • Incorrect responses should not be awarded credit but will still count towards <i>n</i>. • 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 <i>n</i> responses may be ignored even if they include incorrect science.
6	<p><u>Calculation specific guidance</u></p> <p>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'.</p> <p>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.</p> <p>For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (<i>a</i>) 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.</p> <p>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.</p>

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.

Examples of how to apply the list ruleState **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	✓	

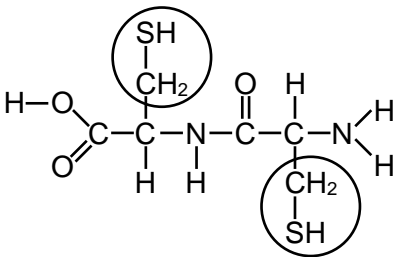
E (4 responses)	1. Correct	✓	3
	2. Correct	✓	
	3. Correct, Wrong	✓	

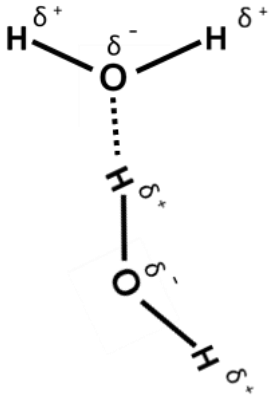
F (4 responses)	1. Correct	✓	2
	2. Correct	✓	
	3. Correct CON (of 3.)	✗ (discount 3)	

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)	

Question	Answer	Marks															
1(a)	<table border="1"> <thead> <tr> <th>cell structure</th><th>eukaryotic cells</th><th>prokaryotic cells</th></tr> </thead> <tbody> <tr> <td>nucleus</td><td>✓</td><td>✗</td></tr> <tr> <td>Golgi body</td><td>✓</td><td>✗</td></tr> <tr> <td>circular DNA</td><td>✓</td><td>✓</td></tr> <tr> <td>70S ribosome</td><td>✓</td><td>✓</td></tr> </tbody> </table> <p>mark by column ; ; STM to consider alternative mark allocations</p>	cell structure	eukaryotic cells	prokaryotic cells	nucleus	✓	✗	Golgi body	✓	✗	circular DNA	✓	✓	70S ribosome	✓	✓	2
cell structure	eukaryotic cells	prokaryotic cells															
nucleus	✓	✗															
Golgi body	✓	✗															
circular DNA	✓	✓															
70S ribosome	✓	✓															
1(b)	<p><i>diagram showing:</i> dark line(s) labelled as, phospholipid / phosphate / , heads ; clear area(s) between pairs of dark lines labelled as, (phospho)lipid / fatty acid, tails / hydrophobic core ; R if pointing to intercellular area clear area between the two cell surface membranes labelled as, intercellular (space), interstitial fluid / tissue fluid / extra-cellular matrix ; accept gap between two cells / AW</p> <p>to be refined at STM consider including exemplar diagram</p>	3															
1(c)(i)	<p><i>G₁ phase:</i> RNA, synthesised / transcription / translation / proteins / enzymes, synthesised / increasing quantity of organelles / increase in volume of cytoplasm / accept growth (at end of G₁ phase) checkpoint passed for dividing or not ;</p> <p><i>S phase:</i> DNA (semi-conservative) replication / doubles, mass / number of strands, of DNA / ref. to one chromosome becomes two chromatids ; allow one chromatid for one chromosome</p>	2															
1(c)(ii)	<p><i>any one from:</i> (leading to) uncontrolled / increased, cell division / mitosis ; resting cells might enter mitosis ; more cells move from the G₁ to the S phase ; tumour / cancer, formation ;</p>	1															

Question	Answer	Marks
2(a)	<p>either R group circled ;</p> 	1
2(b)(i)	disulfide (bonds) ;	1
2(b)(ii)	<p><u>exocytosis</u> ;</p> <p><i>plus any two from:</i> (idea of) vesicles will be large enough to contain many mucins / ref. to bulk transport ; vesicles forming from Golgi, body / apparatus ; vesicles fuse with cell surface membrane ; active process / requires ATP ; AVP ; e.g. mucins polar / hydrophilic, (so) cannot cross, phospholipid bilayer / hydrophobic part of membrane</p>	3
2(c)	<p><i>any two from:</i> (because mucus is too thick) cilia, have difficulty / AW, moving the mucus upwards ; pathogens, build up / not removed / AW ; more chance of; infection / disease ; AVP ;</p>	2
2(d)(i)	deletion ;	1
2(d)(ii)	<p>transcribed / template ; R transcription strand I anti-sense / coding, strand</p>	1
2(d)(iii)	AUC AUU GGU GUU ;	1
2(d)(iv)	<p><i>any three from:</i> idea of 3 bases coding for 1 amino acid ; introns / non-coding DNA, removed from primary transcript RNA / AW ; accept gene splicing accept mRNA does not contain introns R if not in correct context (primary transcript to mRNA) because introns, are non-coding / do not code for amino acids ; DNA triplet / mRNA codon for STOP does not code for an amino acid ; methionine at start / first amino acid / amino acid coded for by START codon, removed ; AVP ; e.g. ref. to (upstream) enhancer sequences ref. to (downstream) terminator sequences ref. to (non-coding) regulatory sequences / promoter</p>	3

Question	Answer	Marks
3(a)(i)	cell Y shows, a sieve plate / sieve pores ; ora idea that the sieve plates are at different heights in the stem / the section misses the sieve plate in cell X / AW ;	2
3(a)(ii)	<i>any four from:</i> protein in companion cell surface membrane, moves / pumps, protons into, cell wall / apoplast ; (using) ATP / by active transport ; establishes a proton gradient ; protons move down their concentration gradient, (back) into the companion cell (by facilitated diffusion) ; alongside / cotransport with, sucrose ; sucrose moves against its concentration gradient ; (through a) cotransporter protein / symporter / a protein carrying both (sucrose and protons) ; diffusion of sucrose into phloem sieve tube, through plasmodesmata ; <i>full marks could be obtained from an annotated diagram</i>	4
3(b)(i)	this could be answered diagrammatically or in text  <i>any two from:</i> <i>idea that</i> oxygen has a small negative charge and hydrogen has a small positive charge ; <i>idea that</i> a hydrogen bond forms between the oxygen of one water molecule and the hydrogen of a neighbouring water molecule ; AVP ; e.g. oxygen is more electronegative than hydrogen	2
3(b)(ii)	<i>any three from:</i> cohesion between water molecules gives a column of water ; H bonds make the water column difficult to break ; H bonding / adhesion, of water molecules to cell wall ; polar water molecules H bond to hydrophilic, cellulose / parts of lignin ; adhesion supports the column of water / AW ; (column of water) pulled upwards by, transpiration / evaporation ; A transpiration pull	3

Question	Answer	Marks
3(b)(iii)	(high latent heat of vaporisation results in) large cooling effect / removal of large quantities of heat energy, by evaporation ; and <i>any one from:</i> ref. to plant leaves heat up, when light absorbed for photosynthesis / at high ambient temperatures ; reduces, protein / enzyme, denaturation ; reduces rate of water loss by, transpiration / evaporation, at high temperatures ; AVP ;	2

Question	Answer	Marks
4(a)(i)	caused by pathogens ; is transmissible / AW ;	2
4(a)(ii)	<i>Mycobacterium tuberculosis / Mycobacterium bovis ;</i>	1
4(b)	natural and passive ;	1
4(c)	<i>any three from:</i> new vaccine contains, altered antigens / antigens of new strains ; antibodies are specific to antigens ; ref. to complementary shape (between variable regions of antibody and antigen) ; ref. to variable regions / Fab, at the ends ; (as flu virus mutates) antigen proteins altered / altered capsid proteins / AW ; requiring antibodies with different variable regions (to be effective) / AW ;	3
4(d)(i)	<i>for children, allow people for polio allow disease</i> <i>any three from:</i> ref. to vaccination programme aims to vaccinate whole populations ; vaccine allows (most) children to have an immune response (against antigens of the disease organism) ; develop, long-term immunity / memory B cells against polio / AW ; (so) these children cannot transmit polio to (infect) others / breaking the transmission cycle ; (so) unvaccinated / non-responding, children are protected / shielded by the large number of immunised / herd immunity / AW ; ref. to achieving herd immunity ; AVP ;	3
4(d)(ii)	<i>any one from:</i> penicillin <u>only</u> acts on bacteria ; accept prokaryotes virus does not have, cell walls / murein / peptidoglycan ; virus does not have, transpeptidases / the enzyme that is, inhibited / acted on, by penicillin ; virus does not grow / penicillin (only) acts on growing cells / AW ; accept when cell wall is, growing (larger) for growing cells virus does not have cellular structure / virus is acellular ;	1

Question	Answer	Marks
5(a)	line drawn from right atrium to the (arrow into the) pump and line drawn from the (arrow out of the) heater back to the (inferior / superior) vena cava ;	1
5(b)(i)	alveolar wall / alveolar epithelium ; accept wall of air sacs STM to consider alternatives, e.g. squamous epithelium	1
5(b)(ii)	<i>any three from:</i> oxygen moves from the (oxygen-enriched) air into the blood and carbon dioxide moves from the blood into the (oxygen-enriched) air / AW ; by diffusion / down their concentration gradients ; (opposite flow arrangement / counter current) maintains a steep diffusion gradient / ref. to equilibrium is not reached / AW ; short diffusion pathway (across the membrane) ; AVP ; e.g. oxygenator membrane (will have a) large surface area	3
5(c)	(the tunica media of aorta) contains, more elastin / more elastic fibres / more elastic tissue / less smooth muscle, than the muscular artery ; ora <i>plus any two from:</i> allows the aorta to stretch / aorta less likely to burst (as a result of high blood pressure) ; during ventricular contraction / systole ; (after stretching) the aorta recoils ; maintains high blood pressure ; evens out the flow of blood / AW ;	3
5(d)(i)	(requires carbonic anhydrase) for speeding up / as enzyme for, conversion of (water and) carbon dioxide to, carbonic acid / hydrogencarbonate ions ; accept bicarbonate ions for hydrogencarbonate ions accept correct equation	1
5(d)(ii)	(chloride shift not required because) hydrogencarbonate ions do not leave the red blood cells so no, need for chloride to enter / charge imbalance /AW ;	1

Question	Answer	Marks
6(a)	<i>any three from:</i> covalent bonds between, R groups / side-chains (of collagen molecules) ; covalent bonds are strong ; between parallel (collagen) molecules ; (molecules) staggered / overlapping molecules, so no weak spots / gives greater strength ; AVP ; e.g. (in skin) fibres line up in layers, not parallel / running in different directions, gives strength in different directions	3
6(b)	<i>any two from:</i> <i>at pH8.0:</i> ionic / hydrogen bonds, between R groups, broken / altered ; loss / change, of secondary / tertiary, structure ; active site shape altered ; no longer / less, complementary to substrate / collagen ; AVP ; e.g. the amino acids in the active site affected by the changing pH ; ref. to partial denaturation ;	2