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# **GCE AS MARKING SCHEME**

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**SUMMER 2024**

**AS  
BIOLOGY - UNIT 2  
2400U20-1**

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## About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

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**WJEC GCE AS BIOLOGY**  
**UNIT 2 – BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS**  
**SUMMER 2024 MARK SCHEME**  
**GENERAL INSTRUCTIONS**

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement. Award the middle mark in the level if most of the content statements are given and the communication statement is partially met. Award the lower mark if only the content statements are matched.

### Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only  
ecf = error carried forward  
bod = benefit of doubt

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)		Anywhere on / directly below the 1st <u>vertical</u> line from the bottom (accept if X drawn correctly on image 1.2)		1		1		
	(b)		<b>Any two (x1) from:</b> Nucleus / nuclear membrane (1) Nucleolus (1) {membrane-bound / named membrane-bound} organelles (1) cell walls contain {cellulose / chitin} (1) {large(r) / 80S} ribosomes (1) linear DNA / DNA associated with histones (1) centrioles (1)	2			2		
	(c)	(i)	<b>Supports</b> {Position 1 / 2 / 3 / 4 / 5 / 6 / equivalent sequence / 6 out of 8 sequences} <b>and</b> data is similar for the Archaea and the Eukaryota / ORA for eubacteria (1) <b>Does not support</b> {Position 7 / 8 / equivalent sequence / 2 out of 8 sequences} <b>and</b> data is {similar for the Eubacteria and the Eukaryote / ORA for Archaea} (1)			2	2		
		(ii)	<b>Any one (x1) from</b> Sample is representative (1) {Increase / improve} reliability (1) polymorphic loci (1) all organisms contain {ribosomes/ rRNA} (1)			1	1		1

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		<b>Any one (x1) from</b> Biochemical analysis more accurate / reduce mistakes due to / OWTTE: convergent evolution (1) analogous structures (1) sexual dimorphism (1)		1		1		
				<b>Question 1 total</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>7</b>	<b>0</b>	<b>1</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		<p><b>Any two (x1) from:</b></p> <p>A. {Arranged vertically / tall cells / elongated cells / thinner cell walls} so light can reach chloroplasts (1)</p> <p>B. Cells closely packed to get {maximum / more} light (1)</p> <p>C. {Many / full of} chloroplasts for (maximum) light absorption (1)</p> <p>D. Chloroplasts contain {chlorophyll / photosynthetic pigments} to absorb light (energy) (1)</p> <p>E. Chloroplasts change orientation for (maximum) light absorption (1)</p>	2			2		
	(b)	(i)	<p>G / stomata. Accept E / spongy mesophyll  <b>and</b>  D / xylem  <b>Both correct for 1 mark (either order)</b></p>		1		1		
		(ii)	<p>C / phloem  <b>and</b>  G / stomata. Accept E / spongy mesophyll  <b>Both correct for 1 mark (either order)</b></p>		1		1		
	(c)	(i)	<p><b>Any one (x1) from</b></p> <p>Relatively {small / few} air spaces (1)</p> <p>stomata on lower epidermis (1)</p> <p>(well developed) xylem (1)</p> <p>Accept reverse answers referring to hydrophyte  (ignore references to cuticle)</p>		1		1		

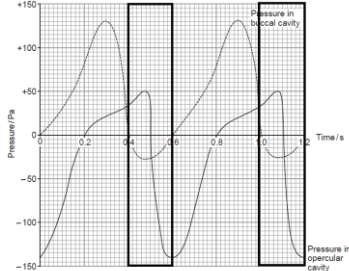
Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		<p><b>Any one (x1) from</b>            Lack of sunken stomata (1)            lack of (stiff) interlocking hairs (1)            leaf not rolled (1)            (relatively) thin waxy cuticle (1)            Accept reverse answers referring to xerophyte</p>		1		1		
	(d)			<p>A. the % of stomata that are open increases to 2pm and then decreases (1)            B. {all stomata / 100% of stomata} are open at 2pm (1)            C. This allows (for more) CO<sub>2</sub> to enter the leaf for photosynthesis during the day / increases transpiration rate to {provide water for photosynthesis / cool the plant} (1)            D. Reduces water loss at night. (1) reject prevent or eq</p>		3	1	4		
				<b>Question 2 total</b>	<b>2</b>	<b>7</b>	<b>1</b>	<b>10</b>	<b>0</b>	<b>0</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	A. HCl converts pepsinogen into pepsin (1) (ignore activates / reacts with) B. Prevents pepsin being activated inside cells (1) C. Pepsin would {hydrolyse / break down} <u>proteins</u> within the (stomach wall / the chief) cells / Pepsin would cause autolysis of cells (1) (ignore digests)		3		3		
		(ii)	{Produce / secrete} mucus (1)	1			1		
		(iii)	<b>Any two (x1) from:</b> A. Endopeptidases are secreted {before / owtte} exopeptidases (1) B. Endopeptidases {hydrolyse / break} {peptide bonds in the middle of the {protein / polypeptide chain} / non terminal peptide bonds} (1) C. This provides <u>more</u> {terminal / end} (peptide) bonds for exopeptidases / owtte (1)			2		2	
	(b)		X: epithelium NOT villus / epidermis / endothelium Y: muscle 2 correct = 1 mark 1/0 correct = 0 marks		1		1		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)	A parasite lives {in / on} a host organism to {derive nourishment / harming host / owtte}	1			1		
		(ii)	<p>A. Reduced the surface area (1)            B. (for the production of enzymes) so less digestion occurs (1)            C. Less glucose absorbed therefore less {respiration/ATP produced} leads to {fatigue / tiredness} (1)            D. Less water absorbed resulting in diarrhoea (1)</p> <p>If MP C or D not gained then allow 1 mark for less absorption (E)</p>		4		4		
			<b>Question 3 total</b>	<b>2</b>	<b>10</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>0</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Potometer	1			1		1
		(ii)		(Leafy shoot must be) cut underwater. (1) {Apparatus / description of} must be assembled underwater / potometer flooded with water. (1)	2			2		2
		(iii)		<b>Any two for one mark</b> Temperature / light <u>intensity</u> / humidity		1		1		1
	(b)	(i)	I	157 / 157.08 / 157.1 (2 marks) Award 1 mark for (3.14 or $\pi$ ) $\times$ 0.5 <sup>2</sup> $\times$ 200 628 / 628.3 (use of diameter instead of radius)		2		2	2	2
			II	49.1 (3 marks) <b>If incorrect award 2 marks for</b> 49 / 49.06 / 49.09 (correct answer but not to 1 dp)  <b>If incorrect award 1 mark for</b> 157 (answer from (b)(i) / 192 $\times$ 60 Allow ecf from (b)(i)		3		3	3	3
		(ii)		<b>Any three (x1) from</b> A. As fan distance increases the <u>rate</u> of water uptake decreases (1) B. As distance increases transpiration (rate) decreases (1) C. Water vapour accumulates / humidity increases / diffusion shells remain outside of the leaf (1) OWTTE D. Decreases the steepness of the {diffusion / water potential} gradient (1) ignore concentration  Accept reverse argument for each marking point		3		3		3

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			<b>Any one (x1) from</b> Some water taken up may have been used in {photosynthesis / hydrolysis reactions / increased turgor} (1) Some water lost may have been produced in {respiration / condensation reactions} (1) Some water lost may have been due to cuticular evaporation (1)		1		1		1
				<b>Question 4 total</b>	<b>3</b>	<b>10</b>	<b>0</b>	<b>13</b>	<b>5</b>	<b>13</b>

Question		Marking details		Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		<p><b>Any four (x1) from:</b></p> <p>A. Mouth opens <b>and</b> <u>floor</u> of buccal cavity lowered (1)</p> <p>B. Increase volume <b>and</b> decreases pressure (in buccal cavity) (1)</p> <p>C. Water enters (the buccal cavity) (1)</p> <p>D. Mouth closes <b>and</b> <u>floor</u> of buccal cavity raised / opercular cavity expands (1)</p> <p>E. Decreases volume <b>and</b> increases pressure (in buccal cavity) / increases volume <b>and</b> decreases pressure in the opercular cavity (1)</p> <p>F. Water is {forced / pushed / moves down a pressure gradient} over the gills (1)</p> <p>MP C can only be awarded in context of MP A or B MP F can only be awarded in context of MP D or E</p>	4			4		
	(b)	(i)	190 Pa ignore – sign		1		1	1	
		(ii)	<p>I</p> <p><b>B</b> in any region of the graph when the buccal pressure is below 0pa</p> 			1	1		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
			II	<p><b>G</b> in any region of the graph when the buccal pressure is greater than the opercular pressure. NOT where lines cross</p>			1	1		
(c)	(i)			(secondary) lamellae / gill plates (accept lamella) NOT filaments		1		1		
		(ii)		<p>The gills have {many / flattened / thin} {lamellae / gill plates / filaments} (1) Which provide a large surface area (1) ignore SA to volume ratio <b>OR</b> {lamellae / gill plates / filaments} are {thin / flattened} (1) Which provide a short diffusion pathway (1)</p>	2			2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		<ul style="list-style-type: none"> <li>The concentration gradient is maintained / equilibrium is never reached (1)</li> <li>Oxygen can <u>diffuse</u> into the blood across the <u>whole of the {gill plate / (secondary) lamellae}</u> (1) ignore reference to time</li> <li><u>More</u> oxygen is absorbed into the blood / blood achieves a <u>higher</u> oxygen saturation / it reaches 80% saturation as compared to 50% (with parallel flow) (1)</li> </ul>	3			3		
	(d)			<p><b>Any two (x1) from</b>            {Lungs / Gulping air} enables <u>oxygen</u> to be obtained (when there is insufficient dissolved oxygen in the water) (1)            Many capillaries maintain a steep concentration gradient (1)            Many (small) air sacs provide a large surface area (1)</p>			2	2		
	(e)			Lungfish and mammals share a common ancestor / shows divergent evolution (1) Reject mammals evolved from lungfish			1	1		
<b>Question 5 total</b>					<b>9</b>	<b>2</b>	<b>5</b>	<b>16</b>	<b>1</b>	<b>0</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Generate its own contraction / does not need to be stimulated by a nerve to make it contract (1) Accept contracts on its own Ignore beats / involuntary / brain	1			1		
		(ii)	I: B II: D / C III: A 3 correct = 2 marks 2 correct = 1 mark 1/0 correct = 0 marks	2			2		
		(iii)	A. { <b>A</b> / SAN} is the pacemaker / initiates the {cardiac cycle / heartbeat} / Sends out a wave of {excitation / depolarisation} across the atria causing {the atria to contract / atrial systole} (1) B. { <b>B</b> / AVN} {receives / delays / transfers} the excitation (1) C. to { <b>C</b> / the bundle of His} which transfers excitation to {apex of heart / <b>D</b> / Purkyne fibres} (1) D. (Excitation) passes up { <b>D</b> / the Purkyne fibres} causing {the ventricles to contract / ventricular systole} (from the apex upwards) (1)	4			4		
	(b)		<b>Award 2 marks for</b> 80 Allow 1 mark for: 60/3 x 4 60/0.75		2		2	2	

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)	P-wave is (always) {present / regular}, (1) but the QRS complex (and T-wave) are {absent / not regular} (1) (ignore longer period between P waves)			2	2		
		(ii)	Ventricular {systole / contraction} (and diastole / relaxation) would not occur (regularly) (1) Reject atrial systole would not occur Blood {remains in the ventricles / does not enter the arteries} (1) (ignore references to time or heart rate)			2	2		
			<b>Question 6 total</b>	<b>7</b>	<b>2</b>	<b>4</b>	<b>13</b>	<b>2</b>	<b>0</b>

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
7	<p><b>Indicative content</b></p> <p>A1 Partial pressure of oxygen increases percentage saturation also increases</p> <p>A2 (Hb has) high <u>affinity</u> for O<sub>2</sub> at {high pO<sub>2</sub> / lungs}</p> <p>A3 {Associates / loads} with O<sub>2</sub> (in the lungs / high pO<sub>2</sub>)</p> <p>A4 (Hb has) low <u>affinity</u> for O<sub>2</sub> {at low pO<sub>2</sub> / tissues}</p> <p>A5 {dissociates / unloads} with O<sub>2</sub> (in the tissues / low pO<sub>2</sub>)</p> <p>A6 sigmoid shape / co-operative binding / steep part of the curve – small drop in pO<sub>2</sub> relatively large % drop in saturation / OWTTE</p> <p><u>Naked mole rat haemoglobin:</u></p> <p>B1 Lives in a low pO<sub>2</sub> environment</p> <p>B2 due to {poorly ventilated / underground} burrows / large number of individuals respiring</p> <p>B3 Has <u>Hb</u> with a higher <u>affinity</u> for O<sub>2</sub></p> <p>B4 <u>Hb</u> can become {fully / higher %} saturated with O<sub>2</sub></p> <p>B5 {At a lower pO<sub>2</sub> / at same pO<sub>2</sub>} as human Hb</p> <p><u>Hummingbird haemoglobin:</u></p> <p>C1 Smaller birds so have a larger surface area: volume so lose heat at a faster rate / Flight muscles 30% of their body weight / beat their wings up to 200 times per second</p> <p>C2 have a higher rate of respiration</p> <p>C3 this produces more CO<sub>2</sub> / increase pCO<sub>2</sub></p> <p>C4 Hb with a lower affinity for O<sub>2</sub></p> <p>C5 so {dissociates / unloads} more O<sub>2</sub> to the tissues / (more) readily releases O<sub>2</sub></p>	3	3	3	9	0	0

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
	<p><b>7-9 marks</b> Indicative content of this level is detailed content from all three sections <i>The candidate constructs an articulate, integrated account, correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses scientific conventions and vocabulary appropriately and accurately.</i></p> <p><b>4-6 marks</b> Indicative content of this level is detailed content from two sections or less detail from three <i>The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate usually uses scientific conventions and vocabulary appropriately and accurately.</i></p> <p><b>1-3 marks</b> Indicative content of this level is any correct statement from one area of the indicative content <i>The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate has limited use of scientific conventions and vocabulary.</i></p> <p><b>0 marks</b> <i>The candidate does not make any attempt or give a relevant answer worthy of credit.</i></p>						
	<b>Question 7 total</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>0</b>	<b>0</b>

## Unit 2 - Biodiversity and Physiology of Body Systems

### SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	2	3	7	0	1
2	2	7	1	10	0	0
3	2	10	0	12	0	0
4	3	10	0	13	5	13
5	9	2	5	16	1	0
6	7	2	4	13	2	0
7	3	3	3	9	0	0
<b>TOTAL</b>	<b>28</b>	<b>36</b>	<b>16</b>	<b>80</b>	<b>8</b>	<b>14</b>