



GCE AS MARKING SCHEME

SUMMER 2023

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

INTRODUCTION

This marking scheme was used by WJEC for the 2023 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

WJEC GCE AS BIOLOGY
UNIT 2 – BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS
SUMMER 2023 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)		The number of species and the number of individuals of each species in a (given) {environment/ habitat/ ecosystem/ area}/ species richness and (species) evenness in an environment (1)	1			1		
	(b)		(>11) no increase in numbers of species present (so waste of time)/ maximum cumulative species total (1) (<11){not all/ fewer} species present/ sample not representative (1)		2		2		2
	(c)	(i)	<u>Erica</u>		1		1		
		(ii)	Only {presence/ absence} of a species recorded/ the number of {individuals/ a species} is not recorded some quadrats may contain >1 of a species (1)			1	1		2
		(iii)	D = 0.77 = 3 marks If incorrect award 2 marks for: 0.77183600 /0.772 (correct calculation but not to 2 dp) 0.8 (correct calculation but not to 2 dp) 0.78 (incorrect rounding but given to 2 dp) 0.23 (correct calculation but not subtracted from 1) If incorrect award 1 mark for either of $\sum n(n-1) = 256$ $N(N-1) = 1122$ 0.771 (correct calculation but not to 2 dp and not correctly rounded)		3		3	3	3
	(d)	(i)	Grazing increases biodiversity Ecf if answer to (iii) is > 0.87 then biodiversity decreases			1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		<p>Any two (x1) from</p> <ul style="list-style-type: none"> Grazing reduces the growth of {medium plants/ tall plants/ silver birch/ gorse/ brambles} (1) More {light/ nutrients/ water/ named nutrients} available/ decreased competition for {light/ nutrients/ water/ named nutrients} (1) Grazers provide fertilizer for plants/ owtte (1) {Seed/ pollen} dispersal/ owtte (1) 			2	2		
				Question 1 total	1	6	4	11	3	8

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	X: venule (1) Y: lymph {vessel/ capillary} (1) Reject lymph/ lymphatic system/ lacteal/ lymph duct	2			2		
		(ii)	Arrow drawn in the direction of right to left		1		1		
	(b)	(i)	<ul style="list-style-type: none"> {Fluid/ water} is lost (from the capillaries)(1) Reject {blood/ tissue fluid/ plasma} for fluid Increased (total) cross-sectional area / Increased resistance/ Ref to friction (1) 		2		2		
		(ii)	(Osmotic pressure caused by) plasma proteins (1) They are too large to leave (the capillary) (1)		2		2		
		(iii)	Any two (×1) from <ul style="list-style-type: none"> Graph shows hydrostatic pressure is greater than osmotic pressure for the majority of the capillary (1) More fluid is forced out than is reabsorbed / or description of production of excess tissue fluid (1) {excess/ remaining} tissue fluid is absorbed (and returns to the blood) (1) 		2		2		
	(c)		When the (smooth) muscle <u>contracts</u> (1) it {causes <u>vaso</u> constriction / reduces the lumen diameter} (1)		2		2		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)	375% = 2 marks Award 1 mark for $(1900 - 400) / 400 * 100$ $1500 / 400 * 100$		2		2	2	
		(ii)	Allows {excess/ more} <u>heat</u> to be lost (from the body)			1	1		
			Question 2 total	2	11	1	14	2	0

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	A: guard (cell) and B: epidermal (cell) Reject epithelium/ endodermal	1			1		1
		(ii)	Any four (x1) from A. K ⁺ actively transported into {cell A/ guard cell} (1) B. starch converted to malate (1) C. Lowers the water potential of the cell (1) D. Water moves into the cell by <u>osmosis</u> (1) E. (due to increase water) Cells {swell up / become turgid} (1) F. (Stomata opens): as the inner cell wall is {thicker / less elastic} than the outer cell walls / walls are unevenly thickened (1) If candidates refer to stomata rather than cells award maximum of 3 marks	4			4		
		(iii)	reduce water loss (1) reject prevent	1			1		
	(b)	(i)	Any two for one mark Temperature Humidity Light <u>intensity</u> / duration of light Volume of water / frequency of watering <u>Soil</u> pH Concentration of {Nutrients/ named nutrient}			1	1		1
		(ii)	As CO ₂ concentration increases {stomatal density decreases/ fewer stomata} / ORA(1)			1	1		1

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iii)	<p>Any three (x1) from</p> <p>A. Stomata <u>open</u> to allow CO₂ (to diffuse) in (1)</p> <p>B. for photosynthesis (1)</p> <p>C. (At higher CO₂ concentrations) there is {an increased rate/ more} of CO₂ {uptake/ diffusion} / ORA (1)</p> <p>D. Sufficient CO₂ can be absorbed with fewer stomata/ ORA (1)</p> <p>E. Therefore less water lost from the plant (1)</p>		2	1	3		
	(c)		<ul style="list-style-type: none"> CO₂ concentrations were decreasing (in the Mesozoic era)/ younger rocks have a lower CO₂ concentration/ older rocks have a higher CO₂ concentration (1) CO₂ concentrations were {<u>higher</u> (in the Mesozoic era than the present day)/ greater than 560 ppm} / ORA (1) 			2	2		2
			Question 3 total	6	2	5	13	0	5

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	<p>Any two (x1) from</p> <ul style="list-style-type: none"> • Many {alveoli/capillaries} / folded alveoli + {provide a large surface area/ increasing <u>rate</u> of diffusion} (1) • {Squamous epithelium/alveolar walls/ capillary walls} are {thin/ one cell thick} + {short diffusion pathway/ increasing <u>rate</u> of diffusion} (1) Reject thin cell walls • {Many capillaries/ good blood supply/ capillary network} + {maintain (steep) concentration gradients/ increasing <u>rate</u> of diffusion} (1) 	2			2		2
		(ii)	<ul style="list-style-type: none"> • (Breakdown of the alveolar walls) reduces the surface area (of the alveoli) (1) • Less oxygen <u>diffuses</u> into the blood/ decreases the rate of <u>diffusion</u> (of oxygen) into the blood (1) 		1	1	2		2
	(b)	(i)	<p>Any four (x1) from</p> <p>A. (External) Intercostal muscles contract and the <u>rib</u> cage moves {upwards / outwards / expands} (1)</p> <p>B. The diaphragm contracts and {flattens/ goes down} (1)</p> <p>C. Pulls on pleural membranes (1)</p> <p>D. Increased {thoracic/ thorax/ lung/ alveolar} volume (1)</p> <p>E. Which decreases {lung/alveolar} pressure (1)</p>	4			4		

Question				Marking details		Marks available					
						AO1	AO2	AO3	Total	Maths	Prac
		(ii)		<p><u>Difference</u></p> <p>Forced expiration is slower in {emphysema/4.4}/ ORA (1)</p>	<p><u>Explanation</u></p> <p>narrowing of bronchioles/ lumen decreases (due to mucus/ thickening of wall) (1)</p>						
				<p>{increased residual volume / forced vital capacity smaller/ less air is forced out of the lungs} in {emphysema/4.4}/ ORA (1)</p>	<p>elastic <u>recoil</u> is lost / elastic <u>recoil</u> is less effective (1)</p>			4	4		2
				Question 4 total		6	1	5	12	0	6

Question			Marking details	Marks available													
				AO1	AO2	AO3	Total	Maths	Prac								
5	(a)	(i)	Organism that requires a source of <u>organic</u> {molecules/ compounds/ chemicals} (for their nutrition)	1			1										
		(ii)	Any three (x1) from: A. Secretion of enzymes (from hyphae) (1) Reject excretes B. Extracellular digestion/ or description of (1) C. of dead (organic) matter (1) D. Absorption of {soluble/ small} {products/ molecules} (1)	3			3										
	(b)		Both { are holozoic / carry out internal digestion / ingest food} (1) Any two (x1) from: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th><i>Amoeba</i></th> <th><i>Hydra</i></th> </tr> </thead> <tbody> <tr> <td>Engulfs food using membrane/ phagocytosis/endocytosis</td> <td>Captures 'prey' with tentacles (1)</td> </tr> <tr> <td>Food taken into a vacuole/</td> <td>Food taken into a {gut/ mouth} (1)</td> </tr> <tr> <td>Intracellular enzymes</td> <td>Extracellular enzymes (1)</td> </tr> </tbody> </table> Must give description of both organisms for each mark	<i>Amoeba</i>	<i>Hydra</i>	Engulfs food using membrane/ phagocytosis/endocytosis	Captures 'prey' with tentacles (1)	Food taken into a vacuole/	Food taken into a {gut/ mouth} (1)	Intracellular enzymes	Extracellular enzymes (1)		3		3		
<i>Amoeba</i>	<i>Hydra</i>																
Engulfs food using membrane/ phagocytosis/endocytosis	Captures 'prey' with tentacles (1)																
Food taken into a vacuole/	Food taken into a {gut/ mouth} (1)																
Intracellular enzymes	Extracellular enzymes (1)																
	(c)	(i)	26/ 26.3/ 26.32 = 2 marks Award 1 mark for correct equation e.g. $1000(\mu\text{m}) / 38$ $((100/38)*0.01)*1000$		2		2	2	1								
		(ii)	Accept any answer between 710-711 Ecf from (i) answer from (i) * 27		1		1	1	1								
			Question 5 total	4	6	0	10	3	2								

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)		3 = 2 marks; 2 = 1 mark: I E II A III C		2		2		2
	(b)		(apoplast) water travels through the cell walls (1) (symplast) water travels through cytoplasm <u>and</u> plasmodesmata (1)	2			2		
	(c)	(i)	Any four (×1) from A. {Casparian strip / suberin} {blocks the apoplast pathway / forces water into the symplast pathway} (1) B. Active transport of ions into the {endodermis/ xylem} (1) C. This lowers the water potential in the {endodermis/ xylem} (1) D. Causing water to move into the {endodermis/ xylem} by <u>osmosis</u> (1) E. Producing <u>hydrostatic</u> pressure (1)	2	2		4		
		(ii)	Any three (×1) from A. Cyanide prevents {(aerobic) respiration / ATP production} / Cyanide is a respiratory inhibitor (1) B. (No ATP) so <u>no</u> active transport of {ions/ solutes} (1) C. Water potential of the {endodermis/ xylem} is not lowered / water potential gradient not established (1) D. So, water not taken up by xylem (1) OR if referring to root hair cell C. Water potential of the root hair cell is not lowered / water potential gradient not established (1) D. So, water not taken up by the {roots/root hair cells} (1)	2		1	3		3
			Question 6 total	6	4	1	11	0	5

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7	<p><u>White-tailed deer:</u></p> <p>A1 Herbivore/ (High) cellulose diet/ herbivorous diet</p> <p>A2 {Large/ interlocking/ridged/ MW shaped} molars to grind plant material.</p> <p>A3 {sharp/chisel shaped} incisors to {cut/ tear} {grass/plant material} (against a horny pad)</p> <p>A4 Diastema {allows manipulation of food by tongue/hold cropped food before being passed to molars}</p> <p>A5 {Open unrestricted roots/teeth continue to grow throughout life} (because teeth are constantly worn down)</p> <p><u>Grey wolf:</u></p> <p>B1 Carnivore/ high protein diet/ carnivorous diet</p> <p>B2 {Large/ pointed} canines to {kill prey/ catch prey/ grip prey/ pierce flesh/ tear flesh}.</p> <p>B3 Sharp carnassials to {slice flesh/ crush bone}. Reject chewing food</p> <p>B4 {Sharp/pointed} incisors to strip flesh from bones.</p> <p><u>Black bear:</u></p> <p>C1 Omnivore/ Omnivorous diet / diet high in cellulose and protein</p> <p>C2 {Large/ pointed} canines to {kill prey/ catch prey/ grip prey/ pierce flesh/ tear flesh}.</p> <p>C3 {Sharp/pointed} incisors to {strip flesh from bones/ cut plant material}.</p> <p>C4 {Large/ flat/ ridged/ interlocking} molars to {grind/ crush} {plant material/ nuts/ insects/ bones}</p> <p>C5 Diastema allows manipulation of plant material by tongue</p>						
		6	3				

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
	<p>7-9 marks Indicative content of this level is detailed description of all three areas of indicative content <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>4-6 marks Indicative content of this level is detailed description of two areas of indicative content or less detail of all three areas <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>1-3 marks Indicative content of this level is detail from any one area of 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>0 marks <i>The candidate does not make any attempt or give a relevant answer worthy of credit.</i></p>						
	Question 7 total	6	3	0	9	0	0

UNIT 2: BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS
SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	1	6	4	11	3	8
2	2	11	1	14	2	0
3	6	2	5	13	0	5
4	6	1	5	12	0	6
5	4	6	0	10	3	2
6	6	4	1	11	0	5
7	6	3	0	9	0	0
TOTAL	31	33	16	80	8	26