



GCE A LEVEL MARKING SCHEME

SUMMER 2024

**A LEVEL
BIOLOGY - UNIT 3
1400U30-1**

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.

WJEC GCE A LEVEL BIOLOGY
UNIT 3 – ENERGY HOMEOSTASIS AND THE ENVIRONMENT
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

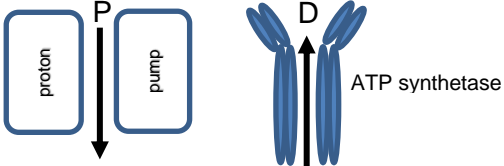
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

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)	(i)			α ketoglutaric	citric acid		2		2		
				Carbon	5	6						
				Hydrogen	6	8						
				Oxygen	5	7						
				1 mark for each column								
		(ii)		Alpha ketoglutaric – B citric A Both required for 1 mark				1		1		
		(iii)		C + O → CO ₂ (1) / released as carbon dioxide (1) Ignore decarboxylation H + NAD → NADH ₂ / accepted by {NAD / cofactor / hydrogen acceptor} / {Reduces / combines} {NAD / cofactor / hydrogen acceptor} / Combines with NAD / carried to ETC (1) Ignore dehydrogenation				2		2		
	(b)	(i)		To show that reaction is enzymic / correct reference to dehydrogenase / owtte Ignore active yeast					1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		{In presence of malonic acid / it / tube 2} (methylene blue) {did not decolourise / stayed blue / is not reduced} (1) Showing it prevented {dehydrogenase activity / dehydrogenation} / owtte (1)			2	2		2
		(iii)		Any two (x1) from <ul style="list-style-type: none"> Competitive Inhibitor (1) Similar shape to succinic acid / {fits into / complementary to} active site(1) Reject Malonic acid is complementary to succinic acid prevents the succinic acid from binding to the active site / forms an enzyme inhibitor complex / prevents the formation of an enzyme substrate complex (1) 			2	2		2
				Question 1 total	0	5	5	10	0	5

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)	<p>Typical (in a layer) near {upper epidermis / adaxial surface} / most chloroplasts are in the palisade {layer / cells / mesophyll} / Spread across the surface (1)</p> <p>Millet concentrated around vascular bundle / owtte near both upper and lower epidermis / found spread throughout the leaf / owtte / ref to clusters (1)</p>		2		2		2
		(ii)	<p>{receive / are exposed to / absorb} light on both surfaces / neither side is in the shade(1) Chloroplasts are closer to the surface on both sides / less structures for light to pass through to reach chloroplasts / owtte (1)</p>			2	2		
	(b)	(i)	Photolysis	1			1		
		(ii)	<p>A_{II} Plotted At 1.8 above PSII, A_I plotted at 2.0 above PSI (1) Allow if points displaced horizontally but NOT vertically Tolerance = less than one small square Points must be labelled correctly Joined by three straight lines in correct pattern (1)</p>		2		2	1	

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iii)	<p>Any five (x1) from</p> <p>A. In PS II {light / photons} {increase electron energy / excite electrons} (1)</p> <p>B. (higher energy electrons emitted and) accepted by {A_{II} / electron acceptor} / owtte (1)</p> <p>C. {Energy decreases / electrons lose energy} as pass through {ETC / electron carriers} (1)</p> <p>D. (Energy used to) {Pump protons / for ATP production / photophosphorylation} (1)</p> <p>E. PS I {electrons raised to higher energy level / excited} and accepted by {A_I / electron acceptor} (1)</p> <p>F. Use of data (1)</p>	4	1		5		
(c)	(i)		 <p>Both correct for 1 mark arrows must be labelled</p>		1		1		
		(ii)	<p>Any three (x1) from</p> <ul style="list-style-type: none"> • Photolysis releases {H⁺ / protons} / photolysis increases concentration of protons} (1) • <u>inside thylakoid</u> {space / lumen} (1) • NADP → NADPH₂ / NADP {is reduced / decreases the concentration of protons} (1) • <u>in stroma</u> (1) 		3		3		
Question 2 total				5	9	2	16	1	2

Question			Marking details		Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		The highest levels (of NO ₂) are {along major roads / where there are most vehicles / owtte} Accept specifically named roads			1	1		
		(ii)	I	circle on black rectangle dot on M4 near Port Talbot			1	1		
			II	the level (of NO ₂ most) exceeds WHO limits / values >60 compared with {WHO limit / 40}			1	1		
	(b)	(i)		<ul style="list-style-type: none"> • Critical value is 1.701 (at p=0.05) (1) • Because t value is greater than {critical value/ 1.701} / 1.769 > 1.701 / ORA (1) • Reject null hypothesis (1) • There is a <u>significant</u> difference between the <u>means</u> / the difference between the <u>means</u> is not due to chance (1) Ecf from incorrect critical value		3	1	4	4	
		(ii)		Emissions were (significantly) higher after closure / ORA (1) Keeping junction open will result in {lower NO ₂ levels / better air quality} (1) Ecf from (i) There was no significant difference in (mean) emissions (1) Closing the junction will not result in any changes in the NO ₂ levels / air quality} (1)			2	2		

Question			Marking details	Marks available									
				AO1	AO2	AO3	Total	Maths	Prac				
		(iii)	I	<ul style="list-style-type: none"> Trees absorb more NO₂ {between {March / April} and {July / August} / when the road was open} / Trees absorb less NO₂ {after August / when the road was closed} (1) This reduces confidence in the conclusion that closing the road increased NO₂ (1) 						2	2		
			II	(Repeat the closure experiment in) {the other months / over longer time period / different times of the year}						1	1		
	(c)			Nitrobacter (1) (Converts nitrite) to {nitrate / NO ₃ ⁻ } (1) (Nitrate) can be {absorbed / converted into amino acids} by {plants / producers} / broken down by {denitrification / <i>Pseudomonas</i> } (1)				2	1		3		
				Question 3 total				2	4	9	15	4	0

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		Nerve net (1) Unmyelinated / branched/ bidirectional impulses / impulses travel in many directions (1)	2			2		
	(b)	(i)	Synaptic {knob / bulb} / axon terminal	1			1		
		(ii)	Vesicle: synaptic Accept secretory / excretory / neurosecretory and Role: transports {neurotransmitter / acetyl choline} Name and function for 1 mark	1			1		
		(iii)	{Acetylcholine / Neurotransmitter} {not broken down / remains in synaptic cleft} (1) Continues to stimulate {post synaptic membrane / adjacent cell}/ Continuous {depolarisation / action potentials} in {adjacent cell / neurone} / more {Acetylcholine / Neurotransmitter} binding to receptor on post-synaptic membrane (1)		2		2		
	(c)	(i)	X- depolarisation Y- repolarisation both for 1 mark	1			1		
		(ii)	(Na ⁺) Channel opens (1) {Na ⁺ / sodium ions} rush {into axon / into neurone / through membrane} (1) Accept flood/ rapidly diffuse in	2			2		

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(d)		<p>Any four (×1) from:</p> <p>A. Increases (up to a maximum / 60) and then decreases (1)</p> <p>B. Depolarisation only takes place at the nodes / Correct reference to saltatory conduction (1)</p> <p>C. Less membrane needs to be depolarised / action potential does not have to travel the whole length of the neurone (1)</p> <p>D. (The Longer the internode the conduction speed increases) due to {less 'jumps' from node to node / influences of local currents increase} (1)</p> <p>E. When internodes are too long, {impulses not able to jump from node to node / local currents are unable to extend to next node / no saltatory conduction} (1)</p>		2	2	4		4
			Question 4 total	7	4	2	13	0	4

Question				Marking details	Marks Available						
					AO1	AO2	AO3	Total	Maths	Prac	
5	(a)	(i)		Any two (×1) from: Flame {mouth of tubes / pipette} (1) Hold lid above base of petri dish/ lift lid {slightly / at an angle} (1) Use a sterile pipette/ pipette tip (1) Work close to (the updraft of) a Bunsen burner (1)	2			2			2
		(ii)		$6.4 \times 10^5 = 2$ marks If incorrect award one mark for $2 \times 32 \times 10000$ 64×10^4 3.2×10^5 (not multiplied by 2) 640000		2		2	2		
	(b)	(i)		$5 = 3$ marks If incorrect award 2 marks for 4.9833887043 (incorrect rounding / not to whole number) If incorrect award 1 mark for $N = \frac{7-4}{0.301 \times 2} \quad (1)$ $N = \frac{3}{0.602}$		3		3	3		
		(ii)		(to give time to) synthesise {enzymes / proteins / DNA} / activating genes Ignore acclimatising to conditions	1			1			
		(iii)		(OD method) counts dead cells as well as living / total count for OD and viable count for the plates (1) For first 40 minutes {no / few} dead cells / owtte (1) As time passes there are more dead cells (1)			3	3			
				Question 5 total	3	5	3	11	5		2

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		(Line) transect	1			1		1
		(ii)		Habitat is the location / owtte (1) Ecosystem {interaction between organisms in the community and their environment / or description of} / Ecosystem comprises biotic and abiotic elements / owtte} (1)	2			2		
		(iii)		Duckweed 0-40 (cm) (1) pondweed 30-70 (cm) (1)		2		2		2
	(b)	(i)		duckweed {gets more light as on surface / deprives pondweed of light / outcompetes pondweed for light}			1	1		
		(ii)		Any two named nutrients for one mark: nitrate / magnesium / phosphate (1) Any two (x1) from (Nitrate to make) {amino acids / proteins / chlorophyll / nucleic acids} (1) (Magnesium to make) chlorophyll (molecules) (1) (Phosphates to make) nucleic acids / phospholipids (1)	3			3		
		(iii)		(Plants / animals) die and bodies sink to form <u>sediment</u> / nutrients are present in the <u>sediment</u> (1) (organic matter in sediment is) decayed to release nutrients (1) Duckweed {cannot reach the nutrients at the bottom / do not have roots in the sediment} / ORA/ owtte (1)		2	1	3		
	(c)	(i)		they can interbreed and produce fertile offspring Accept DNA {sequencing / profiling / fingerprinting / hybridisation} / amino acid sequencing		1		1		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		Discontinuous	1			1		
		(iii)		Better camouflaged / less easily seen (1) Less risk of {predation / being eaten} (1) Less easily seen by predators = 2 marks		2		2		
				Question 6 total	7	7	2	16	0	3

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7	<p>Indicative content</p> <p>Feedback loop A1 Detector {sensitive / reacts} to change in {set / normal} {point / level} A2 Coordinator receives input from detector A3 and responds by sending an impulse to effector A4 Effector bring about a change that corrects the deviation / owtte</p> <p>Osmoregulation B1 {Hypothalamus / osmoreceptors} detects change in {water potential / body fluid concentration / concentration of blood} B2 Hypothalamus sends a signal to the (posterior) pituitary gland B3 Posterior (pituitary gland) releases (more) ADH if {water potential decreases / body fluid concentration increases} / ORA B4 Walls of DCT and collecting ducts act as effectors B5 ADH makes walls of {DCT / collecting duct} more permeable to water Accept more aquaporins incorporated into membranes of {DCT / CD} / ORA B6 <u>More</u> water {diffuses out of collecting duct / reabsorbed} into {medulla / blood} / ORA</p> <p>Excessive alcohol use C1 it is more difficult for fluid to pass through / less ultrafiltration occurs / ultrafiltration is more difficult C2 Less fluid will leave the blood / more water remains in the blood / less filtrate is formed C3 Blood is {more dilute / less concentrated} / blood has a higher water potential C4 Fluid will accumulate {in tissues / reference to oedema} / stops water being drawn back into the blood</p>						

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
	<p>7-9 marks Indicative content of this level is: detailed information from all three sections.</p> <p><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 information from two sections.</p> <p><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 some information from at least one of the sections.</p> <p><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	0	6	3	9	0	0

UNIT 3: ENERGY HOMEOSTASIS AND ENVIRONMENT

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	0	5	5	10	0	5
2	5	9	2	16	1	2
3	2	4	9	15	4	0
4	7	4	2	13	0	4
5	3	5	3	11	5	2
6	7	7	2	16	0	3
7	0	6	3	9	0	0
TOTAL	24	40	26	90	10	16