GCE A LEVEL MARKING SCHEME

SUMMER 2025

A LEVEL
BIOLOGY – COMPONENT 1
A400U10-1

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.

EDUQAS GCE A LEVEL BIOLOGY

COMPONENT 1: ENERGY FOR LIFE

SUMMER 2025 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)		NAD + FAD (1) Accept NADH and FADH / reduced NAD and FAD	1			1		
		(ii)		**Any three (x1) from** • protons {flow / move / diffuse / travel} down a (concentration / electrochemical / owtte) gradient (1) • from inter-membrane space to matrix (1) • through ATP {synthetase / synthase} (1) • provide energy for {ADP + Pi → ATP / description of} (1)	3			3		
		(iii)		**Any two (x1) from** • use a different number of proton pumps in the electron transport chain / owtte (1) • NAD = 3 ATP + FAD = 2 ATP (1) • different numbers of protons {pumped / moved} into inter-membrane space (1)	1	1		2		
	(b)	(i)		(changes in temperature) do not affect {enzyme activity / KE of molecules / rate of reaction} / owtte (1)			1	1		1
		(ii)		Acts as control (experiment) (1) Shows that {change in colour / results} is due to {dehydrogenases / enzymes / respiration} (in the yeast) (1)		2		2		2
		(iii)	I	Colour (vision) is <u>subjective</u> (1) Different students would record different {results / colours} / owtte (1)			2	2		2
			II	using a colorimeter (gives quantitative data / owtte) (1)			1	1		1
				Question 1 total	**5**	**3**	**4**	**12**	**0**	**6**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		based on information available so {not fixed / can change} / owtte	1			1		1
		(ii)		DNA {sequencing / analysis / fingerprinting / profiling / hybridization} (1) Compare (DNA base) sequences / compare (position of) DNA fragments / compare temperatures needed to separate DNA strands / owtte (1) Second mark must match the technique stated in first **OR** {protein / amino acid} sequencing / analysis (1) Compare amino acid sequences / owtte (1) Reject references to {staining techniques / genetics / genetic profile / sequencing unqualified}	1	1		2		
	(b)	(i)		Stage micrometer (1)		1		1		1
		(ii)		2.10µm (1) [2 epu x 1.05 µm]		1		1		1
	(c)	(i)		Facultative anaerobe (1) Produces lactic acid so anaerobic respiration (1) Oxygen present in mouth (but bacteria survive) (1)			3	3		
		(ii)		Dextran sticks to teeth and traps {bacteria / lactic acid} / {bacteria / lactic acid} {remains on teeth / not removed} / ORA (1) Lactic acid {corrodes / owtte} {tooth / enamel} (1)			2	2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			**Any four (x1) from:** A. (Dextran solution) lowers the water potential of {plasma / blood} (1) B. {water / solute} potential of blood {lower / more negative} {than normal / at arterial end} (1) C. (so) less water leaves plasma / less tissue fluid formed (1) D. (at venous end) {water/ solute} potential of plasma is lower than that of tissue fluid (1) E. (so more) water moves from tissue fluid into {plasma / blood / capillaries / (more) tissue fluid reabsorbed (1) F. Increases {blood volume / fluid in blood / level of water in blood} which {restores / increases} blood pressure (1)		1	3	4		
				Question 2 total	**2**	**4**	**8**	**14**	**0**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Nitrogen (1) Sulphur (1)	1	1		2		
		(ii)		Strengthen plant cell walls (1) Component of chlorophyll (1)	2			2		
	(b)	(i)		Algae would {use minerals / compete for minerals} from solution / owtte / ORA (1) So {restrict / limit} growth of duckweed / owtte / ORA (1)		1	1	2		2
		(ii)		Clear to allow light in (1) For photosynthesis (1) OR Prevent evaporation of water (1) Maintain concentration of solution (1)	1	1		2		2
		(iii)		Yellow (1)	1			1		
		(iv)		Correct labels and scale: X axis = micronutrient omitted **and** bar labels (1) Y = <u>mean</u> dry mass + mg (unit) + suitable linear scale **with number at origin** (1) Bars drawn to correct height (1) If plot an (x,y) graph then penalise last mp only		3		3	3	3

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(v)		**Any five (x1) from:** **(Mn omitted)** A. less photolysis + {fewer protons / H+ released} / fewer electrons for ETC (1) B. less ATP synthesised (1) **(Fe omitted:)** C. fewer electrons transferred to {NADP / final electron acceptor} (1) D. less NADPH produced / owtte (1) E. (less ATP and NADPH) leads to lower production of TP (1) F. (less ATP) reduces regeneration of ribulose-5-phosphate / RuBP) G. (so) less {carbon fixation / GP} (1) H. less {glucose for respiration / amino acids for protein synthesis} / ref to less reactants for cell activity (1)		3	2	5		
				Question 3 total	**5**	**9**	**3**	**17**	**3**	**7**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		(if planetary boundary crossed we risk) {irreversible / abrupt} environmental change / damage to the planet} owtte (1)	1			1		
		(ii)		**Any four (x1) from:** (deforestation) A. Less {photoautotrophs / plants / trees} to carry out photosynthesis / removal of {photoautotrophs / plants / trees} results in less photosynthesis (1) B. reduces (natural) removal of CO_2 from the atmosphere / ORA (1) C. (more) dead organic matter decayed / (more) saprotrophs causing decay (1) D. (More) respiration (of saprotrophs) releases (more) CO_2 (1) E. (Decay of more dead trees from deforestation) releases more CO_2 than that removed by photosynthesis / owtte (1) F. Increased carbon dioxide linked to climate change / greenhouse gas (1)	2	2		4		
	(b)	(i)		<u>Direction</u> of {energy / biomass transfer} (from one trophic level to another) (1)		1		1		
		(ii)	I	Slug (1)		1		1		
			II	Thrush (1) Accept hoverfly		1		1		
		(iii)		The Sun / sunlight / light (1)	1			1		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		(so if fruit / veg not washed) humans could ingest {toxic / harmful} level of pesticide (1) ORA Acetyl choline {not broken down / levels in the synapse remain high} / synaptic transmission affected / continued muscular contraction (1)			2	2		
		(ii)		3.325×10^{-3} / 3.33×10^{-3} / 3.3×10^{-3} (3) **If incorrect award 2 marks for:** 0.003325 / 0.0033 / 0.003 3.32×10^{-3} incorrect rounding **If incorrect award 1 mark for:** 3.325 (1) 95 x 0.035 (1)		3		3	3	
		(iii)		Rats {may respond differently than humans / are genetically different to humans / have different tolerances} (1) OWTTE			1	1		1
	(d)	(i)		**Any two (x1) from:** • increased stability over wider range of {pH / temperature} / owtte (1) • can be reused (1) • specific (1)	2			2		
		(ii)		X = alpha helix (1) Bond = hydrogen (bond) (1)	1	1		2		
		(iii)		**Any two (x1) from** • enzymes are specific to a substrate / owtte (1) • So need different enzyme for each chemical tested / owtte (1) • Enzymes may not exist naturally for a synthetic chemical / take time to synthesise artificial enzymes / owtte (1)		1	1	2		
				Question 4 total	**7**	**10**	**4**	**21**	**3**	**1**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Glycolysis (1)	1			1		
		(ii)		Substrate-level phosphorylation (1)	1			1		
		(iii)		Decarboxylase + dehydrogenase (1)		1		1		
		(iv)		48 (2) **If incorrect award 1 mark for:** 12 x 4 (1) 12 ATP per Krebs cycle (1) 9 + 2 + 1 [Description of how 12 ATP per cycle achieved] (9 (from NADH), 2 (from FADH), + 1 (from SLP)) (1) 36 + 8 + 4 [Description of how 48 ATP per 4 cycles achieved] (36 (from NADH), 8 (from FADH), + 4 (from SLP)) (1)		2		2	2	
	(b)	(i)		{Same number of each atom/ same molecular formula / same chemical formula} but {different arrangement of atoms / structural formula different} (1)	1			1		
		(ii)		Name = carboxyl / carboxylic acid **and** Formula = COOH **Both for one mark**	1			1		
	(c)	(i)		Reduced (1) {Hydrogen / H^+/ electrons / e^-} is added (1)		2		2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**Any three (x1) from:** • Shape of NAD and NADH similar (1) • Can fit into active site (of IDH) (1) • Block the active site (of IDH) / Prevent formation of ES complexes (between {NAD / isocitrate} and IDH) (1) • Increased production of NADH {inhibits / decreases} α-ketoglutarate levels (1)		1	2	3		
	(d)	(i)		(pH maintained) using a buffer (1) pH can change shape of active site / affect ability of IDH to bind to NAD (1)	1	1		2		2
		(ii)		35 (2) **If incorrect award 1 mark for:** 35.4…. (1) 28/79 x 100 or (79-51)/79 x 100 (1)		2		2	2	
		(iii)		**Any three (x1) from:** [at low activity levels:] A. less ATP used so concentration of ATP increases (1) B. (therefore) rate of delivery of hydrogen (to ETC) decreases / concentration of NADH increases (1) C. (this causes increased) inhibition of IDH (1) D. (therefore) rate at which NADH (and FADH) is produced (in Krebs) is reduced (1) E. fewer H^+ pumped into intermembrane space / lower H^+ gradient established (between intermembrane space and matrix) (1) F. so (rate of) ATP synthesis decreases (1)			3	3		
				Question 5 total	**5**	**9**	**5**	**19**	**4**	**2**

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>6</td><td>(a)</td><td>(i)</td><td></td><td>Endangered / vulnerable (1)</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>
<table>
<tr><th>Factor</th><th>Abiotic</th><th>Biotic</th><th>Density-dependent</th><th>Density-independent</th></tr>
<tr><td>Atmospheric temperature</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>Disease</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Drought</td><td>✓</td><td></td><td></td><td>✓</td></tr>
</table>
Abiotic + biotic correct = 1 mark
Density and density independent correct = 1 mark</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td>Any two for 1 mark:
• {poaching / hunting}
• {farming / competition from domestic animals} /
• {deforestation / habitat destruction} /
• pollution</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>150 (3)
If incorrect award 2 marks for:
145 / 145.2 (2)
t = 22 x 6.6
t = 22 x (3.3 x 2)
If incorrect award 1 mark for:
t = 22 x (3.3 x log(1000/10)) (1)
22 = t / (3.3 x (log(1000/10)) (1)</td><td></td><td>3</td><td></td><td>3</td><td>3</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>Immigration of elephants /
migration of elephants into area /
{Larger area so more food / greater carrying capacity} + greater breeding success /
find {more mates /mates more easily} and {breed faster /owtte} (1)</td><td></td><td></td><td>1</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 6 total</td><td>1</td><td>6</td><td>1</td><td>8</td><td>3</td><td>0</td></tr>
</table>

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
7	**Indicative content:** **Primary succession** A1 **colonisation** (of bare rock) (by lichens and mosses) A2 **pioneer** species (of plants – annuals) A3 (followed by) **perennials/ grasses** A4 (and then) **shrubs** A5 finally {trees / forest} to form the **climax community** A6 each stage referred to as a **sere** / ref to **seral stages** **Increase in biodiversity** B1 increasing total number of {organisms / plants / animals} B2 more {species (of plants) / species richness} B3 improved food source (for animals) / increased NPP / wider food webs / owtte B4 increased number of {ecological niches / habitats / places to live} B5 decay (of dead organisms) increases {soil fertility / ref to soil formation} B6 less variation in abiotic factors e.g. soil moisture content / shade **Managed forest succession** <u>Timber production:</u> C1 trees grow faster / more wood grows each year / wood volume increase C2 less time to reach {felling/ suitable / owtte} height C3 increased (useful) harvest <u>Environment</u> C4 less trees die as less disease C5 {increased carbon storage / less decay so less CO_2 released} benefits climate change C6 (slight) increase in species biodiversity	5	4		9		

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
	7-9 marks Indicative content of this level is detailed statements from all three areas of the indicative content. *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.* **4-6 marks** Indicative content of this level is detailed statements from two areas of the indicative content. *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.* **1-3 marks** Indicative content of this level is any correct statement from the indicative content *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.* **0 marks** *The candidate does not make any attempt or give a relevant answer worthy of credit.*						
	Question 7 total	**5**	**4**	**0**	**9**	**0**	**0**

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

QUESTION	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	3	4	12	0	6
2	2	4	8	14	0	3
3	5	9	3	17	3	7
4	7	10	4	21	3	1
5	5	9	5	19	4	2
6	1	6	1	8	3	0
7	5	4	0	9	0	0
TOTAL	**30**	**45**	**25**	**100**	**13**	**19**