GCE A LEVEL MARKING SCHEME

SUMMER 2025

A LEVEL
BIOLOGY – COMPONENT 3
A400U30-1

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.

GCE A LEVEL BIOLOGY

COMPONENT 3 – REQUIREMENTS 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

<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>1</td><td>(a)</td><td></td><td></td><td>
<table>
<tr><th>Component of reflex arc</th><th>Letter</th></tr>
<tr><td>Coordinator (spinal cord)</td><td>B</td></tr>
<tr><td>Effector</td><td>C</td></tr>
<tr><td>Motor neurone</td><td>D</td></tr>
<tr><td>Receptor</td><td>G</td></tr>
<tr><td>Response</td><td>E</td></tr>
<tr><td>Sensory neurone</td><td>F</td></tr>
<tr><td>Stimulus</td><td>A</td></tr>
</table>
4 correct = 2 marks
2/3 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></td><td></td><td>Any three from (x1)
A. Reference to threshold
B. Sodium <u>ion</u> {rapid influx / flood in/ rapid diffusion inwards/ owtte} (into axon/ axoplasm) (1)

C. {Through/ using/ via} sodium (ion) {channels/gates} / ref to sodium (ion) {channels/ gates} being open (1)
D. Depolarisation (1)
E. Axon becomes {more positive /+40mV} (1)</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
</table>

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<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td></td><td>Any three from (x1)
One mark per row

<table><tr><th>Hydra</th><th>Human</th></tr><tr><td>No {brain/ spinal cord/ cephalisation}/
No CNS</td><td>Brain/ spinal cord/ CNS</td></tr><tr><td>No myelin /Slow conduction</td><td>Myelin/ faster conduction</td></tr><tr><td>Few sensory receptors/ detect fewer stimuli</td><td>Many sensory receptors/ detect more stimuli</td></tr><tr><td>Lots of branching (in many directions)/
bi directional</td><td>Fewer branches/ unidirectional</td></tr><tr><td>Simple nerve cells /</td><td>More complex nerve cells/ {more than one type of/names of types} nerve cell</td></tr><tr><td>Few effectors</td><td>Many effectors</td></tr><tr><td>Regeneration (of nerves)</td><td>{No/ slow} regeneration (of nerves)</td></tr></table></td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Any two (x1) from
• {Longer to return to/ slower decrease to} resting potential in hydra/ Longer repolarisation (1)
• threshold {higher/ less negative} (1)
• No hyperpolarisation/ No refractory period (1)
• Action potential generated faster (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 1 total</td><td>6</td><td>4</td><td>0</td><td>10</td><td>0</td><td>0</td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		**Any one (x1) from:** increases surface area/gives large SA:Vol (1) {short/ decreased} diffusion {distance/pathway} (1)	1			1		
		(ii)	I	Mean = 27 Accept 26.8333333…..		1		1	1	1
			II	6.7 - 6.8 or 7 μm 2 marks Award 1 mark for Answer in (a)ii I /20 x 5 Allow full marks for ecf from (a)ii I		2		2	2	2
			III	**Any one (x1) from:** • Not all lying flat/ viewed in different {planes/angles}/ not {perfectly circular/ owtte} • May be different {ages/ developmental stages} / different water content		1		1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		Use of data e.g. at 4 kPa ppO2 70% saturation in foetus = 40%, in adult (1) **Any two (x1) from:** • {HbF has a higher {affinity for oxygen / saturation at lower partial pressures} (1) • (therefore) HbF can bind oxygen from mother's (blood) / oxygen can {diffuse / pass} from mother to baby (1) • Foetus lives in (the uterus which is a) low oxygen environment (1)		3		3	1	
		(ii)		**Any two (x1) from** HbS has lower affinity for oxygen (1) {Less oxygen saturation/ more oxygen {dissociated / unloaded}} at {all / any given / same} ppO2 (1) Use of data to compare HbA and HbS(1)		2		2		
		(iii)		less oxygen to {tissues / muscles / cells} for respiration (1) Tired/ fatigued / lethargic / less able to exercise / less ATP produced (1)		2		2		
				Question 2 total	**1**	**11**	**0**	**12**	**4**	**4**

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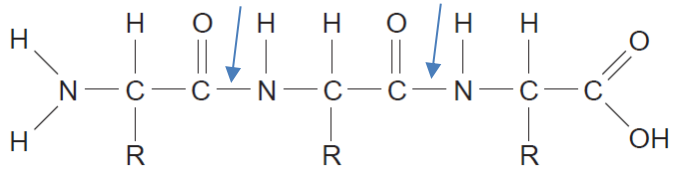
<tr><td>3</td><td>(a)</td><td></td><td></td><td>A. Test with Benedict’s and heat – {negative result / stays blue / no colour change} (1)

Any three (x1) from
B. {Heat/ warm} {sample / raffinose / sugar} with (dilute) {HCl / acid} (1)
C. Neutralise the (acid) solution (with sodium hydrogen carbonate) (1)
D. (repeat) Benedict’s test (and heat) (1)
E. {red / orange / yellow/ green} (shows it was a non-reducing sugar) (1)</td><td>3</td><td>1</td><td></td><td>4</td><td></td><td>4</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td><table><tr><th></th><th>Mode of transport</th><th>Explanation</th></tr><tr><td>1</td><td>Diffusion (1)</td><td>from a high to low concentration/ down a concentration gradient (1)</td></tr><tr><td>2</td><td>Active transport (1)</td><td>from a low to high concentration/ against a concentration gradient (1)</td></tr></table></td><td></td><td>4</td><td></td><td>4</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>(Molecules converted to raffinose so) {lower concentration of / less} {sucrose/ solutes} in the companion cell (1)
{Diffusion/ concentration} gradient {maintained/ increased/ steeper} (1)</td><td></td><td></td><td>2</td><td>2</td><td></td><td></td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			**Any four (x1) from** A. Sugars in the {sieve tube elements / phloem} {reduce water potential/ increased solute potential} (1) B. Water moves into {sieve tube elements / phloem} (1) C. down water potential gradient (1) D. by osmosis (1) E. (water moving into phloem) increases <u>hydrostatic</u> pressure / owtte (1)	3	1		4		
	(d)	(i)		To act as a <u>control</u> (experiment) (1) To show where the {radioactivity / ^{14}C} {went / owtte} when there was no ringing (1)			2	2		2
		(ii)		**Any two (x2) linked conclusions** Plant {B and C / D} No sucrose movement past ring (when phloem is removed) (1) proves phloem transports sucrose (1) OR Plant {A/ B and C} shows {sucrose/ ^{14}C} in both {tip/ top} and root (1) Sucrose can move {upwards and downwards/source to sink/ owtte} (1) OR Plant A shows more ^{14}C in tip than root (1) {Higher usage of sucrose / increased respiration/ increased cell division} in tip than root (1)			4	4		4
				Question 3 total	**6**	**6**	**8**	**20**	**0**	**10**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Endoparasite – lives {within / in} a {host / organism} **and** Ectoparasite – live on the {surface / outside / owtte} of a {host / organism} (1)	1			1		
	(b)			*Taenia* A. Absorbs nutrients from the {gut / digestive system / owtte} across its {cuticle / surface / membrane / skin} (1) B. (Has no digestive system) as nutrients {have already been digested / predigested} by the host (1) *Pediculus* C. {Bites the scalp to take / feeds on / sucks} blood from host (1) D. (Digestive system needed) {break down / digest} {haemoglobin / blood / plasma proteins} (1)		2	2	4		
	(c)	(i)		{Optimum / owtte} of pH {7-9 } (in trypsin) is similar to the pH of duodenum (1)		1		1		
		(ii)		enterokinase / enteropeptidase(1)	1			1		
		(iii)		 (1) One correct arrow from two shown above		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		**Any one (x1) from** To reduce osmosis into the *Taenia* (1) so it does not take up water (1) no net movement of water in (1) it is isotonic to cells (1) Taenia would lyse (if they took in water) (1)			1	1		1
		(ii)		(Taenia decreases the pH of its environment) away from the optimum for trypsin (1) Trypsin {deactivated / denatured/ inactive} / no trypsin activity (1) Reject {less / reduced} trypsin activity Trypsin cannot break down taenia (body wall) / owtte (1) Max 2 if trypsin not mentioned			3	3		3
		(iii)		Non-competitive inhibition (1) not overcome by increasing substrate concentration / at any substrate concentration the rate of reaction is always lower with antitrypsin / does not reach maximum rate / owtte (1)		2		2		
				Question 4 total	**2**	**6**	**6**	**14**	**0**	**4**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Low surface area:volume (1) Diffusion (over surface) {insufficient/ too slow / owtte} to meet {metabolic requirements / oxygen demand / owtte} (1) ORA for small organisms	2			2		
	(b)	(i)		Mammals – urea Birds – Uric acid **both needed for 1 mark**	1			1		
		(ii)	I	lower water availability – higher {urine concentration / osmolality} / ORA (1)		1		1		
			II	Less water needed from environment/ less water lost / more water {conserved / retained / reabsorbed}		1		1		
		(iii)		Large {range of / differences} in the {values / data / numbers} / owtte (1)		1		1	1	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iv)		**Any four (x1) from** Mammals living in areas with low water availability A. have a thicker medulla (1) B. which contains longer {loops of Henle /collecting duct} (1) C. More {ions/ correct named ions} pumped into {medulla/ tissue fluid} (from ascending limb of loop of Henle) (1) D. (Therefore,) more negative <u>water potential</u> in medulla/ owtte (1) E. More water {reabsorbed from/ moves out of} {(descending limb) loop of Henle/collecting duct} (1)			4	4		
	(c)	(i)		96 ($cm^3\ min^{-1}$) (3 marks) If incorrect award 2 marks for 96.25 96.3 If incorrect award 1 mark for 3.3 x 7/ 0.24		3		3	3	
		(ii)		decrease (1) particle (x) could reach toxic levels (in the plasma)/ build up of toxic particles/ more toxic particles remain in the blood/ increased concentration of toxic particle (1)			**2**	**2**		
				Question 5 total	**3**	**6**	**6**	**15**	**4**	**0**

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
6	**Indicative content** **Snail** A1 {Circulatory fluid/ haemolymph/ blood} not in vessels A2 {Circulatory fluid/ haemolymph/ blood} flows {around/in contact with/ bathe} the {cells/ tissues/ organs} A3 single heart A4 Low pressure (from heart) A5 Slow flow / flow not {controlled/ Directed} **Squid** B1 (all) blood contained in blood vessels B2 {Circulatory fluid/ haemolymph/ blood} not {around/in contact with} the {cells/ tissues/ organs} B3 {More than one/ three} heart B4 {High/ more} pressure (from heart)/ pressure maintained B5 Fast flowing blood/ flow {controlled/ directed} **Lifestyle** Squid - C1 (fast moving predator) has to hunt prey/ move away from own predators/ owtte C2 requiring rapid muscle contraction/ owtte C3 High demand for oxygen/ High rate of {respiration / metabolism} Snail C4 (slow moving herbivore) does not need to hunt / owtte C5 Low demand for oxygen/ low rate of {respiration / metabolism}	6	3		9		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Indicative content of this level is…detailed description of all three areas of 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…description of at least two areas of 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… description of at least one area of 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 6 total	**6**	**3**	**0**	**9**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			• Infectious disease: (a disease that) may be {passed/ transmitted/ spread} from one individual to another/ owtte • Toxin: a chemical produced by a {microorganism/ pathogen} which causes {damage/ harm} (to its host). • Antigen: Any substance which stimulates {the production of antibodies by the immune system/ immune response}/ protein on surface that antibodies bind to / owtte} 3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks	2			2		
	(b)	(i)		Actual diameter = 35- 37 mm = 2 marks **If incorrect award 1 mark** 22 or 21 / 0.6 (1)		2		2	2	
		(ii)		Penicillin G has largest diameter (1) However, overlapping standard deviations with amoxycillin / owtte (1)		1	1	2		1
		(iii)		**Any two (x1) from:** (Incubation) temperature (1) Density of bacterial culture/ concentration/ volume (1) (Incubation) time (1)			2	2		2
	(c)	(i)		(Tetracycline affects) protein synthesis/ inhibits translation/ blocks ribosome binding site (1)		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**Any three (x1) from**: • Transmembrane protein {specific to tetracycline / will not remove penicillin} (1) • *S. pyogenes* has a thick peptidoglycan cell wall so will be affected by penicillin/ ORA (1) • Penicillin inhibits cross linkage formation in cell wall (1) • (so cell wall) weakened (1) • bacteria die due to osmotic lysis/ or description of (1)			3	3		
		(iii)		**Any three (x1) from**: • (Mutations result in) some bacteria in population having a resistance allele (1) • (Overuse of antibiotics) favours bacteria with the resistance allele / bacteria with allele are not killed/have a selective advantage} (1) • The allele is passed down to next generation / ref to transfer of plasmids (1) • Frequency of the allele increases in bacterial population (1)		3		3		
	(d)	(i)		**Any three (x1) from** • *S. pyogenes* antigen presentation/ clonal selection (1) • T helper cells {secrete cytokines / cause activation of B cells} (1) • Clonal expansion (of B cells)/ or description of (1) • (Differentiation into) plasma cells (1) • (which produce) antibodies to *S. pyogenes* / toxin (1) • Memory cells {retained/ remain in blood/ owtte} (1)	1	2		3		
		(ii)		<u>Natural passive</u> (immunity) (1) (From) antibodies { in breastmilk / crossing the placenta} (1)	2			2		
				Question 7 total	**5**	**9**	**6**	**20**	**2**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		**Any one (x1) from** Support (1) Protection (1) Muscle attachment (1)	1			1		
		(ii)		Scoliosis (1) {Thoracic/ lumbar} region (1)		2		2		
		(iii)		Bracing / physiotherapy / or description (1)	1			1		
	(b)	(i)		Myosin {(heads) lost / shortened} **and** Actin filaments shortened (1) Less binding {of actin and myosin/sites} / less cross bridge formation (1) Less shortening of sarcomeres (causing weakness) / owtte (1)			3	3		
		(ii)		**Any two (x1) from** (Fewer mitochondria) so less ATP / less energy (1) {Movement of myosin head / breaking of cross bridges / owtte} requires {energy / ATP} (1) Muscle remains contracted (1)		2		2		
		(iii)		5.9 - 6.7 µm **2 marks** **If incorrect award 1 mark** 60/10 or 9 (x 1)		2		2	2	
	(c)	(i)		fatigue slowly / muscles tire less easily / less build up of lactic acid (1)		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		Different muscles have different {proportions / ratios / percentages} of fibre types (1) allows {direct / fair} comparison / make results comparable (1)		1	1	2		1
		(iii)		**Any two (x1) from:** Same activity levels / level of exercise (1) Same age (1) Same gender (1) Same ethnicity (1) Same BMI/ body mass / fitness / health (1) Sufficient sample size (1)			2	2		**2**
	(d)	(i)		bones touching / {reduced/ no} joint space / break down of cartilage in joint / owtte (1)		1		1		
		(ii)		surgical risks such as increased risk of a blood clot and infection (1) long recovery period (1) the replacement joint could fail after 15-20 years / would need replacing (1)	3			3		
				Question 8 total	**5**	**9**	**6**	**20**	**2**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		13mm (2) 1 mark for 20/15 x 10		2		2	2	
		(ii)		Surface area of cerebral cortex is greater / cerebral cortex has higher degree of folding ORA / larger {cerebral cortex/ cerebrum} relative to the total brain size (1)		1		1		
		(iii)	I	Size of feature proportional to degree of innervation / OWTTE (1)		1		1		
			II	Sensory: large number of sensory {receptors/ neurones} /owtte (1) Motor: need precise control / fine motor control / intricate movement/ owtte (1)		2		2		
	(b)	(i)		Without need for surgery / non invasive (1) Show details of {entire brain / soft tissue / owtte} (1)	2			2		
		(ii)		Functional magnetic resonance imaging (1)	1			1		
		(iii)		More oxygen supplied (to neurones) in the {region of the brain / parts of brain} that are more active (1) (Aerobic) respiration provides {ATP/ energy} (to neurones) (1)		2		2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		**Any two (x1) from** distance (1) direction (1) sugar solution (1) colour (1) size of feeder (1)			2	2		2
		(ii)		A **and** {range bars / sd} are shorter / less overlap in the {data/ bars} (1)			1	1		1
		(iii)		The greater the distance to the feeder, the longer the duration of the waggle dance (1) **Any two (x1) from** Other worker bees can learn how far to fly to the food source (1) Food source can be located more {quickly /efficiently} (1) More food for the colony (1)		1	2	3		
		(iv)	I	Innate behaviour is {instinctive / does not have to be learned / genetic} whereas learned is acquired / owtte (1)	1			1		
			II	Innate: mating behaviour/ blinking/ suckling/ shivering when cold/ any named reflex reaction (1) Learned: tool use/ grooming/wjec5126 problem solving (1)	2			2		
				Question 9 total	**6**	**9**	**5**	**20**	**2**	**3**

COMPONENT 3

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

QUESTION	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	**6**	**4**	**0**	**10**	**0**	**0**
2	**1**	**11**	**0**	**12**	**4**	**4**
3	**6**	**6**	**8**	**20**	**0**	**10**
4	**2**	**6**	**6**	**14**	**0**	**4**
5	**3**	**6**	**6**	**15**	**4**	**0**
6	**6**	**3**	**0**	**9**	**0**	**0**
TARGET	**24**	**36**	**20**	**80**	**0**	**0**
TOTAL	**24**	**36**	**20**	**80**	**8**	**18**