GCE A LEVEL MARKING SCHEME

AUTUMN 2021

A LEVEL
BIOLOGY – COMPONENT 1
A400U10-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2021 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.

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GCE A LEVEL BIOLOGY COMPONENT 1

ENERGY FOR LIFE

AUTUMN 2021 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.

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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

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		Found in grana / thylakoid membranes	1			1		
		(ii)		**Any three (×1) from:** Groups of different {pigments / accessory} + which absorb light at different wavelengths. (1) Chlorophyll a at centre / chlorophyll a in reaction centre (1) PS 1 and PSII (1) Chlorophyll at centre absorb slightly different wavelengths. (1)	3			3		
	(b)	(i)		Pencil does not dissolve in solvent/ ORA (1) {Pigments in ink/ sample} would dissolve in solvent (1)	2			2		2
		(ii)		Spot extract, {evaporate /dry}, repeat.	1			1		1
		(iii)		**Any one (×1) from:** Solvent could transfer from hand to eye when pouring into chamber + wear eye protection (1) Solvent could splash on hand when pouring into chamber + wear gloves/ wash hands if solvent lands on skin (1) Accept any step in the method that involves solvent		1		1		1
		(iv)		Same {solvent / chromatography paper / TLC medium}		1		1		1
	(c)	(i)		45/75 = 0.60 (1) Chlorophyll a (1) Accept 44-46 74-76		2		2	2	2
		(ii)		Spot each pigment {at same origin/ on same paper} (1) Compare position with original sample (1)			2	2		2
				Question 1 total	**7**	**4**	**2**	**13**	**2**	**9**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		A Coccus B Bacillus C spirillum **All correct for 1 mark**	1			1		1
		(ii)		D is Gram +ve + so has a {murein/ peptidoglycan} cell wall (1) E is Gram -ve + so has an additional outer layer of {lipoprotein/ lipopolysaccharide} (1)	2			2		2
		(iii)	I	Nitrogen: amino acids/ proteins/ nucleic acids/ ATP	1			1		
			II	Phosphorus: phospholipids/ nucleic acids/ ATP/ DNA	1			1		
	(b)			X -ve × ✓ *S. epidermidis*. (1) Y. +ve × × *M. luteus*. (1) Z. -ve ✓ ✓ *S. aureus*. (1)			3	3		3
				Question 2 total	**5**	**0**	**3**	**8**	**0**	**6**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Prevent increase in temperature in plant chamber			1	1		1
		(ii)		Different plants would have different {mass/surface area}/ A different plant could have different numbers chloroplasts/ other variables are controlled so only independent variable is being tested.			1	1		1
		(iii)		Repeat with same apparatus and conditions (1) No plant (1)			2	2		2
		(iv)		Repeat but in dark		1		1		1
	(b)	(i)		(True) rate of photosynthesis given by total mass of CO_2 used= mass absorbed from air + mass produced by respiration/ Owtte		1		1		1
		(ii)		30.2; 30.7; 30.1; 17.2 All correct = 1 mark		1		1		1
	(c)	(i)		**Any four (×1) from:** A. Photosynthesis increases slightly from 15-30 °C (1) B. More sugar produced (1) C. 30 °C and above less sugar produced (1) D. Greater increase in rate of respiration 15-40 °C (1) E. More sugar broken down as temp increases (1) F. There will be a temperature where a further increase causes more sugar to be broken down than produced (1) G. Use of data (1)		2	2	4		

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		Advantage: Less water loss (1) Disadvantage: Carbon dioxide cannot diffuse into leaf (1)			2	2		
	(d)	(i)		Epigenetics (1)	1			1		
		(ii)		mRNA not produced/ no transcription (1) translation does not take place / enzyme (which produce chemicals) not produced (1)			2	2		
				Question 3 total	**1**	**5**	**10**	**16**	**0**	**7**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Conversion into {a form which can be used by living organisms / organic compound/ name organic compounds}	1			1		
	(b)	(i)		**Any three (×1) from:** Nitrosomonas + Nitrobacter (1`) (Nitrosomonas +) NH_4^+/ ammonium ions to nitrites (1) (Nitrobacter +) NO_2 / nitrite ions to nitrates (1) Reference to release e^- and H^+ from water (1)		3		3		
		(ii)		electron transport {chain/ system} Accept electron carriers	1			1		
		(iii)		**Any three (×1) from:** Pumping protons (1) against concentration gradient (1) from cytoplasm into (bacterial) cell wall (1) creating proton gradient (1)		3		3		
		(iv)		Protons flow down concentration gradient (1) Through {stalked particle/ ATP synthase/ ATP synthetase} (1) Provide energy to join ADP and Pi (1)	3			3		
	(c)			**Any three (×1) from:** GP reduced to TP by $NADH_2$ (1) Using energy from ATP (1) ATP donates a P group to regenerate RUBP (from RUP) (1) Carbon fixation / production of glucose / TP / organic compounds (1)		3		3		
				Question 4 total	**5**	**9**	**0**	**14**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		-41% [3] If incorrect award 2 marks for (-)40.99/ 41 If incorrect award 1 mark for (1288-760)/ 1288 x 100 528 Allow for doubling of numbers to allow for pairs		3		3	3	
		(ii)		All species declined in {presence of hedgehogs/ area 2} (1) Not the only cause as dunlin and snipe also declined in {absence of hedgehogs/ area 1} (1) Ecf if refer to an incorrect % change in Redshank numbers			2	2		2
		(iii)		Advantage: can compare different starting numbers (1) Disadvantage: If numbers are small then any change results in a large % change/ can result in apparently more significant changes than actually occurred (1)		1	1	2		2
		(iv)		**Any two (×1) from:** No natural predators (1) Abundance of food / no interspecific competition (1) Less traffic (1)		2		2		
	(b)	(i)		To confirm that hedgehogs were responsible for decline (1) To assess impact of other predators (1)		2		2		2
		(ii)	I	May cause a problem in area into which introduced/ spread of disease/affect balance of ecosystem (1)			1	1		
			II	Prevent natural movement of other species (1)			1	1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
			III	Wrong to kill animals when species already in decline/ numbers threatened / protected species (1)			1	1		
				Question 5 total	**0**	**8**	**6**	**14**	**3**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		**Any four (×1) from:** A. ATP synthesis via electron transport chain stops (1) B. Because cyanide stops transfer of an electron to final electron acceptor (1) C. Electrons cannot be accepted by electron carriers / cytochromes along ETC (1) D. Flow of electrons stops (1) E. Electron donors $NADH_2$ and $FADH_2$ cannot be oxidised (1)		3	1	4		
		(ii)		**Any three (×1) from:** NADH (from glycolysis) cannot pass H to Krebs (1) H given to pyruvate to make lactate (1) So that NAD regenerated (1) So that glycolysis can continue and make ATP anaerobically (1)		3		3		
	(b)			2315/ 2314 [3] **If incorrect award 2 marks for:** 2314.8 / 2314.8148 1388.9/0.6 (number of seeds) **If incorrect award 1 mark for each of:** 125/0.09 (mass of apple seeds needed)		3		3	3	
				Question 6 total	**0**	**9**	**1**	**10**	**3**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		The final stage of succession, in which the species composition remains relatively stable (1) Repopulation / recolonization of an area that had been previously colonised (1)	2			2		
		(ii)		**Any four (×1) from:** A. Sea otters eat sea urchins so kelp forests regrow (1) B. Wider range of ecological / niches/owtte (1) C. (Because Sea otters eat a range of food) no single species dominates the habitat (1) D. As density of population of a particular prey increases more are eaten by the predator (1) E. As a result the prey population decreases (1) F. Predator eats more of a different species (1)		4		4		
		(iii)		**Any three (×1) from:** A. As sea otter numbers decline sea urchins are not eaten so less kelp (1) B. Less photosynthesis (1) C. Less CO_2 removed from environment / more CO_2 remains in environment (1) D. Carbon dioxide is a greenhouse gas (1)			3	3		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iv)		**Any one factor (×1) + explanation (1) from:** Sea temperature increases (1) To above what is suitable for organisms, e.g. algae in corals (1) OR Atmospheric temperature increasing (1) Faster than organisms can adapt (1) OR Ice caps melt/ expansion of water leading to higher sea levels (1) Causing destruction of habitat /owtte (1)	2			2		
	(b)	(i)		1.2×10^5 [2] If incorrect award 1 mark for: 120000		2		2	2	
		(ii)		Insulation helping to maintain core body temperature		1		1		
		(iii)		**Any two (×1) from:** International cooperation restricting trade in fur (1) Legislation to prevent hunting (1) Protected areas (1) Breeding programmes	2			2		
				Question 7 total	**6**	**7**	**3**	**16**	**2**	**0**

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<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>8</td><td></td><td></td><td></td><td>Mitochondria (A)

<table><tr><th>structure</th><th>adaptation</th></tr><tr><td>Inner mitochondrial membrane</td><td>Contains etc for ATP synthesis</td></tr><tr><td>cristae</td><td>Folded inner membrane to increase surface area</td></tr><tr><td>Intermembrane space</td><td>Enables Proton gradient to be established</td></tr><tr><td>matrix</td><td>Producing carriers</td></tr><tr><td>Ribosomes</td><td>Produce {enzymes/ dehydrogenase/ decarboxylase}</td></tr></table>
Chloroplast (B)

<table><tr><th>structure</th><th>adaptation</th></tr><tr><td>Thylakoid membrane</td><td>Contain photosystems/ photosynthetic pigments for harvesting light/
electron transfer chain – production of ATP</td></tr><tr><td>grana</td><td>large area of thylakoid membranes/ large number of thylakoid</td></tr><tr><td>Thylakoid space</td><td>Enables proton gradient to be established</td></tr><tr><td>Stroma</td><td>Contains enzymes for Calvin cycle/ owtte</td></tr><tr><td>Ribosomes</td><td>Produce enzymes/ rubisco</td></tr></table></td><td>6</td><td>3</td><td>0</td><td>9</td><td>0</td><td>0</td></tr>
</table>

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				Endosymbiont theory (C) • Cristae similar to mesosomes in bacteria • Thylakoid membranes similar to photosynthetic membranes in bacteria. • Circular DNA • No histones associated with DNA • DNA not enclosed by nuclear membrane. • Small ribosomes. 70s (80s in eukaryotes) • Capable of division. • Double membrane **7-9 marks** Indicative content of this level is detailed coverage of all three areas *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 coverage of two areas or less detailed coverage of all three areas. *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.*						

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-3 marks Indicative content of this level is coverage of one area. *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 8 total	**6**	**3**	**0**	**9**	**0**	**0**

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COMPONENT 1:

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	7	4	2	13	2	9
2	5	0	3	8	0	6
3	1	5	10	16	0	7
4	5	9	0	14	0	0
5	0	8	6	14	3	6
6	0	9	1	10	3	0
7	6	7	3	16	2	0
8	6	3	0	9	0	0
TOTAL	30	45	25	100	10	28

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