GCE A LEVEL MARKING SCHEME

SUMMER 2022

A LEVEL
BIOLOGY – UNIT 3
1400U30-1

INTRODUCTION

This marking scheme was used by WJEC for the 2022 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 A LEVEL BIOLOGY

UNIT 3 – ENERGY HOMEOSTASIS AND THE ENVIRONMENT

SUMMER 2022 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)		20 000 = 2 marks Award 1 mark for 2000 X 10(dilution factor) 2000		2		2	2	2
		(ii)		60 minutes		1		1		2
	(b)	(i)		Stationary	1			1		
		(ii)		Counts dead cells (as well as live cells)/ it is a total count/ it is not a viable count	1			1		1
		(iii)		**Any four (x1) from** A. Take sample/ transfer (a volume) of {culture/ bacteria/*E.coli*} (1) B. Serial dilution / description of (1) C. Plate out /description of adding {dilution/owtte} to {agar/ growth medium} (1) Ignore put on/ in a Petri dish D. Incubate /description of being left for (suitable) time (at suitable temperature) (1) E. Count (bacterial) <u>colonies</u> (1) Reject count bacteria		4		4		4
	(c)	(i)		Spherical Reject round/ circular	1			1		
		(ii)		Gram negative + has lipopolysaccharide (membrane)		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		(Image 1.2 shows a) Gram negative result (1) Reject positive/ stain pink Both {gram negative/ stain pink} (1) Both are Gram negative= 2 marks Both stain pink = 1 mark			2	2		
		(ii)		Syphilis/ *Treponema (pallidum)* (1) cells are {helical/spiral/coiled/ spirillium} / cells are not spherical (1)			2	2		
				Question 1 total	**3**	**8**	**4**	**15**	**2**	**9**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2.	(a)	(i)		Endangered – (existing in such small numbers that it is) {in danger of/ at risk of/ close to} {becoming extinct/ dying out/ owtte} / very few (individuals) remaining **and** Extinct - there are no more individuals of that species alive (anywhere in the world)/ species {has died out/ owtte}/ none of a species remaining (1)	1			1		
		(ii)		**Any two (x1) from** • Pollution (1) • {Hunting/ fishing} (1) • Introduction/ competition of alien species (1) • Competition from domestic animals (1) • Natural selection (1) • Global warming/ climate change (1)	2			2		
	(b)	(i)		Secondary succession (1)	1			1		
		(ii)		**Any three (x1) from** A. Presence of {soil/ spores/ seeds/ owtte} B. Pioneer species are the first to return C. {presence alters conditions/ owtte} allowing other species to grow (1) D. Seres/ seral stages **+** the sequential progression of species to form intermediate communities/ or description of (1) E. Climax community **+** remain {stable / in equilibrium/ owtte} / final stage of succession (1)	3			3		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		{Population/ gene pool} in fragment would be small (HW would not apply) (1) Genetic drift will cause changes in allele frequencies/ ORA (1)		1	1	2		
		(ii)		• Most risk- Q P R -least risk (1) • Correct reference to {ease/ difficulty} of {gene flow/ reproducing with main population} (1) • R is {attached/ has corridor} (1) • Q is {further away than P/ most isolated/ furthest away}/ ORA (1) Alternative: • Most risk- PQ R -least risk (1) • Correct reference to {ease/ difficulty} of {gene flow/ reproducing with main population} (1) • R is attached/ has corridor (1) • P was separated before the others (1)		3	1	4		
	(d)	(i)		41.2 % = 2 marks If incorrect award 1 mark for any of 41.22 $(300^2-230^2) /300^2 * 100$ 37100/90000 * 100		2		2	2	
		(ii)		Smaller the patch the greater the {percentage/ area} influenced by edge effects/ ORA (1) **Any two (x1) from** light (intensity/ wavelength) (1) temperature (1) humidity (1) wind/ air movement (1)		3		3		
				Question 2 total	**7**	**9**	**2**	**18**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3.	(a)			Light intensity at plant = 400 = 3 marks If incorrect award 2 marks 4 x ($1/0.1^2$) If incorrect award 1 mark for answer below given in table 0.0100 / 0.01/ 0.010		3		3	3	
	(b)	(i)		4207.616/ 4207.62/ 4207.6/ 4208 mm^3 = 2 marks If incorrect award 1 mark for y=(20.322 x 178) +590.3 4207/ 4207.7 (incorrect rounding)		2		2	2	
		(ii)		Temperature/ CO_2 {concentration/ level}/ background light			1	1		3
		(iii)		Light is not limiting (at 0.050m/400Wm^{-2})/ another factor is limiting (at 0.050m/400Wm^{-2}) (1) {Temperature/ CO_2 {concentration/ level}/} limiting (at 0.050m/400Wm^{-2}) (1)			2	2		
				Question 3 total	**0**	**5**	**3**	**8**	**5**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4.	(a)	(i)		Hypothalamus	1			1		
		(ii)		(posterior) pituitary Reject anterior pituitary	1			1		
		(iii)		ADH	1			1		
		(iv)		Collecting ducts/ Distal convoluted tubule/ DCT	1			1		
	(b)			**Any three (x1) from** A. (hormone) makes (the target cells) <u>more</u> permeable (to water) (1) B. Correct reference to (more) aquaporins being inserted into membrane (1) C. {Medulla/ tissue} has a {lower potential/ owtte} D. So water moves {into the tissue/ out of the filtrate} by osmosis (1) E. And a small volume of {concentrated / hypertonic} urine released. (1)	3			3		
	(c)			**Any five (x1) from** A. Impulses (arrive at tip and) open (voltage gated) Na^+ channels (1) B. Na^+ ions {rapidly pass/ flood/ owtte} into neurosecretory cell (1) C. {Axon/Membrane} is depolarised (1) D. which causes opening of (voltage gated) Ca^{++} channels (1) E. Ca^{++}ions diffuse into neurosecretory cell (1) F. and cause hormone containing vesicles to {move to/ fuse with} the membrane/ correct reference to exocytosis. (1)		5		5		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			• (Body fluids) {will become too dilute / have a high water potential/ will accumulate/ build up}/ correct reference to oedema (1) • (entry of) water {lyses cells/ causes cells to burst} (1)			2	2		
				Question 4 total	**7**	**5**	**2**	**14**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5.	(a)			ATP and NADPH are produced in the light-dependent reactions (1) **Any one (x1) from** • {Electrons/H atoms/reduced coenzymes/ $NADPH_{(2)}$} are needed for GP to TP (1) • ATP needed to {re-phosphorylate/ provide energy/ regenerate RuBP/ for GP to TP} (1) • So that the amounts of ATP and NADPH are not rate limiting in light-independent reactions (1)	2			2		
	(b)	(i)		**B** is correct (1) Any **one** (x1) from Because {glycerate phosphate/GP} appears first (1) Reference to data e.g. GP is present at 5secs (1)			2	2		2
		(ii)		• Without nitrate X is not {produced/ present} / Compound X needs nitrate to be formed/ X must contain nitrogen (1) • X is amino acid/ nucleotide/ organic base / protein/ enzyme/ ATP/ named examples of above (1) Reject nitrate		1	1	2		
	(c)	(i)		<u>Stroma</u> (in chloroplast) (1)	1			1		
		(ii)		Accept values 1.3 to 1.75µm = 2 marks Award 1 mark for $\frac{23\ or\ 24}{7{,}8\ or\ 9}$ × 500 Values in nm between 1300 and 1750		2		2	2	
	(d)	(i)		Increased yield/ faster growth/ {bigger/ sweeter} crops/ increased photosynthesis (1) Because plants will take in more CO_2/ more CO_2 is available to the plant (1)		1	1	2		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		• Increased photosynthesis / decreased atmospheric CO_2/ more CO_2 absorbed (1) • Will improve prospects for endangered species (1) • (Because less CO_2 results in) less greenhouse effect / less climate change/ global warming/ higher yield leading to less habitat destruction (1)		3		3		1
				Question 5 total	**3**	**7**	**4**	**14**	**2**	**5**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6.	(a)			To provide {energy / ATP} for (1) **Any two for one mark from** • active transport • synthesis of {{large/ biological} molecules/ proteins/ complex carbohydrates/ lipids/ nucleic acids} • cell division	2			2		
	(b)		I	2	1			1		
			II	3		1		1		
			III	4		1		1		
	(c)	(i)		If there is oxygen available = acetyl CoA/ If there no oxygen available = lactate (1)	1			1		
		(ii)	I	reduction (1)	1			1		
			II	provides the {electrons/H} / reduces the pyruvate / acts as a {hydrogen/ electron} {donor/ carrier} (1)	1			1		
			III	oxidation/ dehydrogenation (1)	1			1		
	(d)	(i)		glycerol (1)			1	1		
		(ii)		fatty acids will be <u>synthesised</u> from Acetyl CoA (1) Glycerol and fatty acids will undergo a <u>condensation</u> reaction to form lipids (1)			2	2		
				Question 6 total	**7**	**2**	**3**	**12**	**0**	**0**

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7.	**Indicative content** **Section A: Environmental impacts** • (Excess) use of (inorganic) fertiliser • {Nitrates/ fertilizer} {washed/ leached/ run off} into {river/ water} • Causing algal blooms {along banks of Mississippi/ shown in image 7.1} • Blocking sunlight {causing plants to die/ means plants cannot photosynthesise} • Bacteria decompose plants using up oxygen • causing {lack of oxygen environment and {fish/ organisms} to die/ dead zones in {image 7.2/ named location} **Section B: Root nodules** • GM plants grew much better in low nitrate • Root nodules contain {N fixing bacteria/ rhizobium} • Correct reference to symbiosis/ mutualism • ({Rhizobium/ bacteria} in root nodules was) providing {nitrogen containing compounds/ nitrates/ ammonium} **Section C: Lessening impact** • Use of node forming plants increases {N content of soil/ soil fertility} • {Less/ no} (inorganic) fertiliser needed • Less {algal blooms/dead zones/ eutrophication} • Higher yield therefore less land needed for crops • Therefore more land available {for habitats/ increasing biodiversity}						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Indicative content of this level is. Detailed information from all three lists *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 information from 2 of the lists or less detail from 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.* **1-3 marks** Indicative content of this level is some information from at least one of the lists to little information from more than one list. *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	**0**	**5**	**4**	**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	3	8	4	15	2	9
2	7	9	2	18	2	0
3	0	5	3	8	5	3
4	7	5	2	14	0	0
5	3	7	4	14	2	5
6	7	2	3	12	0	0
7	0	5	4	9	0	0
TOTAL	27	41	22	90	11	17