GCE A LEVEL MARKING SCHEME

SUMMER 2019

A LEVEL (NEW)
BIOLOGY - UNIT 3
1400U30-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 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 BIOLOGY - UNIT 3
SUMMER 2019 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	8 (ms) = 2 marks Award 1 mark for: 0.0083 1/120 8.3 8.33		2		2	2	
		ii	Threshold was not reached (so no action potential) (1) Not enough {sodium ions/ Na^+} entered the {neurone/ axon}(1) Reject sodium unqualified		2		2		
	(b)	i	Schwann (cell)	1			1		
		ii	Lipid/ fat	1			1		
		iii	5.15×10^{-5} s = 3 marks 0.0000515 s = 2 marks 5 150/1×10^{8} = 1 mark		3		3	3	
	(c)	i	Any **four** (×1) from A. Rate would increase (1) B. Because more aerobic respiration (1) C. Saltatory conduction would not occur/ Whole membrane would need to be depolarised/ action potentials would occur at more places along neurone/ shorter local circuits occur (1) D. so more {Na^+/K^+} pumps (have to work across whole length of exposed membrane)/ more active transport(1) E. More ATP needed (to maintain resting potential) (1)			4	4		
		ii	Any **two** (×1) from: Person would feel tired/ exhaustion/ feel weaker (1) Lack of feeling/ OWTTE (1) {Longer/ slower} reaction times (1) paralysis/ no response/ loss of muscle control (1)			2	2		
			QUESTION 1 TOTAL	**2**	**7**	**6**	**15**	**5**	**0**

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
2	(a)	i	Any **one** (×1) from: Reflected/ not absorbed (by chloroplast)/ {transmitted/ passes} through leaf (1) wrong wavelength for {photosynthesis/ photosystem} (1) energy loss due to respiration (1)	1			1		
		ii	1.3% = 2 marks If incorrect award 1 mark for 27 560/2.12×10^6		2		2	2	
	(b)		Any **four** × (1) from: A. Soil erosion less likely (1) B. Allows light to reach ground level to stimulate growth (1) C. Seeds from neighbouring trees reach cut area (1) D. (Secondary) succession can take place (1) E. Habitat maintained/ {New/ more} niches available (1) F. Dead leaves/ material from trees in the adjoining areas can add nutrients to the soil (1) G. Soil not as wet as in mass felling (therefore more oxygen available for root growth / maintains higher soil temp / less denitrification) (1) Accept reverse argument for all points			4	4		
			QUESTION 2 TOTAL	**1**	**2**	**4**	**7**	**2**	**0**

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
3	(a)		Accept any answer in the range 613 000 - 624 000 = 3 marks Accept in standard form If incorrect award 2 marks for either 100/(0.09 × 0.09) × 3.14 (π) × 156 100/0.025(43) × 156 If incorrect award 1 mark for area calculation 0.09 × 0.09 × 3.14 (π)		3		3	3	
	(b)	i	Serial dilution description (of tenfold/ hundredfold) e.g. 1 cm^3 of sample and 9 cm^3 of {water/ growth medium} mixed (gives 10^{-1}) (1) or equivalent (does not have to give 10^{-5}) Water/ saline/ equipment must be sterile / reference to aseptic technique(1) Repeated four more times/ method to achieve a 10^{-5} dilution (1) Accept annotated diagram	3			3		3
		ii	Plate 5 (1) (Plate 1/2/3/4)- cannot distinguish individual colonies/ too many colonies to count accurately /merged colonies (might provide underestimate) (1) (Plate 6) has too few colonies to provide an accurate estimate (closer to the true value)/ too few to be statistically significant (1) Penalise bacteria once only			3	3		3
		iii	37°C is body temperature which is optimum for these bacteria/ 37°C grows the bacteria found in the patient / 37°C grows the bacteria found in the patient faster (1)		1		1		1
		iv	Thick {murein/peptidoglycan} layer (1) No lipopolysaccharide layer (1)	2			2		
			QUESTION 3 TOTAL	**5**	**4**	**3**	**12**	**3**	**7**

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
4	(a)	i	Number of bubbles (in a minute for 5 minutes)		1		1		1
		ii	The glucose is used up (in respiration) / {decrease in live population of yeast/ some yeast die}/ Build up of toxic waste NOT reference to oxygen		1		1		1
		iii	Bubbles vary in size(1) measuring <u>volume</u> of gas (1) OR Bubbles too fast to count (1) slow motion recording / measuring <u>volume</u> of gas (1)		1	1	2		2
		iv	Decrease/ become acidic (1) CO_2 {dissolved in solution/released/ produced}/ carbonic acid produced (1)			2	2		1
		v	Sucrose is {a disaccharide/ made of glucose and fructose} (1) Has to be {hydrolysed/ broken down} (before it can be respired)/ 3 minutes was not enough time {to produce sucrase / for sucrase to act}/OWTTE (1)		2		2		
		vi	Any **two** × (1) from: Can be used in all organisms (1) For {most/ all} reactions (1)	2			2		
	(b)	i	Any **three** × (1) from: Glucose is used in glycolysis takes place in the cytoplasm (1) Glucose cannot enter mitochondria/ pyruvate can enter the mitochondria(1) Pyruvate used in link reaction and takes place in the mitochondria (1) no enzymes for glycolysis in mitochondria/ ORA (1)		3		3		
		ii	ADP required to generate ATP (1) Accept equation Oxygen is {final electron acceptor/termimal electron acceptor/ converted to water} (1)		2		2		

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
	(c)	i	Released as heat (1) Keeps baby warm/ maintains body temp/ counteracts high surface area to volume ratio (1)	1	1		2		
		ii	Higher number of capillaries (1) to supply the tissue with {oxygen / nutrients / named nutrient}/ remove carbon dioxide from the tissues (1) and distribute the produced heat throughout the body/ increased respiration rate/ produces more heat to maintain body temperature (1)		1	2	3		
			QUESTION 4 TOTAL	**3**	**12**	**5**	**20**	**0**	**6**

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
5	(a)	i	Intraspecific (1) Space/ food (1)	1	1		2		
		ii	*Semibalanus* could not survive in an area that experienced so much desiccation / extreme changes/ OWTTE Reject cannot survive at high tide level not qualified			1	1		
		iii	*Semibalanus* is a more successful competitor in the lower zone/ *Chthamalus* is outcompeted in this area (1) There is interspecific competition normally/ A lack of interspecific competition after clearing (1)		2		2		
	(b)	i	A. Choose {same / random} {positions/ aspect} on each statue (1) B. Use of quadrat to count {number/ percentage cover} of barnacles (1) C. Repeat 1) D. Calculate a mean (1)	3	1		4		3
		ii	Due to water potential in the cell being lower than the surrounding water (1) water would move in by osmosis (1) cells would lyse/ burst (1)			3	3		
	(c)	i	{Genetic/ DNA} {fingerprint/ profiling}/ DNA base sequencing/ DNA hybridisation	1					
		ii	**2 correct answers for 1 mark from:** UV light (Chemical) mutagen Ionizing radiation Errors in DNA replication NOT radiation alone	1					

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
	(d)		Any **four** × (1) from: A. Could outcompete {native/ other} species (1) B. May not have a natural predator in this area (1) C. This will reduce the biodiversity (around the coast)/ impact on food chains (1) D. Could cause damage to the {harbours/ boats} (more friction so more fuel costs)/ boats use more fuel so higher economic impact (1) E. Economic impact of removal of barnacles from {boats/ harbour}/ prevention of barnacle growth (1) F. Introduction of disease (1)			4	4		
			QUESTION 5 TOTAL	**6**	**4**	**8**	**18**	**0**	**3**

<table>
<tr><th colspan="3" 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>445-450<u>nm</u></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>to absorb a greater range of wavelengths of light</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>i</td><td>Can <u>only</u> {survive/ grow} in absence of oxygen/ ORA</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>B (1)
Middle of the cell membrane is {non-polar/ made of fatty acids}/ fatty acids are {non-polar/ hydrophobic} (1)
Only award 2nd mark if 1st correct</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>Any four × (1) from:
<table>
<tr><th></th><th>Sulfur bacteria</th><th>Green plants</th></tr>
<tr><td>A</td><td>1 photosystem</td><td>2 photosystems</td></tr>
<tr><td>B</td><td>H_2S used</td><td>H_2O used</td></tr>
<tr><td>C</td><td>Sulfur released</td><td>Oxygen released</td></tr>
<tr><td>D</td><td>{Bacteriochlorophyll/ carotenoids} in reaction centre</td><td>Chlorophyll a in reaction centre</td></tr>
<tr><td>E</td><td>Reduced NAD formed</td><td>reduced NADP formed</td></tr>
<tr><td>F</td><td>Protons pumped out of cell</td><td>Protons pumped into the thylakoid space</td></tr>
<tr><td>G</td><td>Cyclic photo-phosphorylation only</td><td></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></td><td>QUESTION 6 TOTAL</td><td>2</td><td>7</td><td>0</td><td>9</td><td>0</td><td>0</td></tr>
</table>

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
7			**Indicative Content** **PCT** • All glucose and some sodium ions (selectively) reabsorbed (back into the blood) • Using co transport with Na^+ • Lowers the water potential of the blood • So water out of filtrate into blood by osmosis • So less water in filtrate **Descending limb of loop of Henle** • Drop in water due to: • Permeable to water • Water moves out of filtrate by osmosis into {tissue/interstitial fluid} • Due to high concentration of Na+ ions there • Sodium ions increase in descending limb due to diffusion back in from interstitial fluid / medulla **Ascending limb of loop of Henle** • Impermeable to water • So water does not move out so levels stay same • Na+ actively transported out (into interstitial fluid) • So drop in ascending • Makes filtrate more concentrated with Na+ at bottom of loop / reference to counter current multiplier **7-9 marks** Detailed explanation of all three sections. Including correct reference to graph for 8-9 marks.	5	4				

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	TOTAL	Maths	Prac
			The candidate constructs an articulate, integrated account, 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** Explanation of two areas or brief explanation of 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** Brief explanation of any 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 to give a relevant answer worthy of credit.						
			QUESTION 7 TOTAL	5	4	0	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	2	7	6	15	5	0
2	1	2	4	7	2	0
3	5	4	3	12	3	7
4	3	12	5	20	0	6
5	6	4	8	18	0	3
6	2	7	0	9	0	0
7	5	4	0	9	0	0
Total	**24**	**40**	**26**	**90**	**10**	**16**