GCE AS MARKING SCHEME

SUMMER 2019

AS (NEW)
BIOLOGY - COMPONENT 2
B400U20-1

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.

EDUQAS AS COMPONENT 2
BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS

MARK SCHEME SUMMER 2019

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)		0.88/ 0.875/ 0.9		1		1	1	
		(ii)		left ventricle has {thicker wall/ more muscle} than right ventricle (and therefore produces higher pressure)		1		1		
		(iii)		Reduced flow rate (1) which allows more time for {gas exchange/diffusion}/ less tissue fluid produced (1)		2		2		
	(b)	(i)		Arrow drawn from right to left along the capillary (1)		1		1		
		(ii)		Higher pressure at arterial end (due to ventricular systole) (1) Large number of capillaries increase cross sectional area/ reference to friction (1) Loss of fluid/ formation of tissue fluid (1)		3		3		
	(c)	(i)		Tendons / chordae tendineae	1			1		
		(ii)		Prevent inversion of (bicuspid) valve/ owtte (1) During contraction of (left) ventricle (1)	2			2		
	(d)			Ensure animals are treated humanely / Ensure no animals killed needlessly			1	1		
				Question 1 total	**3**	**8**	**1**	**12**	**1**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Secrete digestive enzymes (on to food) / Food is digested externally/ extracellular digestion (1) Absorb products of digestion into cells (1)	2			2		
	(b)			Magnesium / Mg^{2+} (1) Required to synthesise chlorophyll so algae could not photosynthesise without it (1) OR Nitrate/ phosphates (1) Required for {amino acid / nucleic acid (DNA, RNA, ATP, NADP)} synthesis so algae could not metabolise / grow without it. (1) OR Sulfates (1) Required for amino acid synthesis (1) **Answers must be linked to correct function for second mark**	1	1		2		
	(c)			Any **two** (×1) from Near upper surface to {capture sunlight for photosynthesis / to absorb enough CO_2} (1) Fungal mycelium prevents dehydration of algae (1) Arranged in thin layer because light will not penetrate deeper into thallus (1)		1	1	2		
	(d)			Any **two** (×1) from Algae are {autotrophic/ produce {sugars / organic molecules} (1) Algae produce oxygen which the fungi can use for (aerobic) respiration (1) Fungi {are heterotrophic /cannot produce their own {sugars/ organic molecules} (1) Reference to symbiotic relationship/ mutualism (1)			2	2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(e)			{DNA sequencing / genetic fingerprinting / Compare the base sequence of DNA} from both algae (1) If the sequence {of bases/ banding} from the two are the {same/ similar} they are the same species/ ORA (1) OR DNA hybridisation (1) Explanation of comparison of results (1)	2			2		2
				Question 2 total	**5**	**2**	**3**	**10**	**0**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		7- 7.25 % per kPa = 2 marks If incorrect award 1 mark for (Anything in range 28 – 29)/4 = 1 mark		2		2	2	
		(ii)		Small {increase/ decrease/ change} in partial pressure results in a large {increase/ decrease/ change} in % saturation(1) More efficient unloading of oxygen to respiring tissues /Reaches saturation at lower partial pressures (1)		2		2		
	(b)	(i)		Carbonic anhydrase catalyses the combination of carbon dioxide with water (1)	1			1		
		(ii)		Chloride ions (1) To maintain electro(chemical) neutrality OWTTE (1)	2			2		
		(iii)		Any **four** (×1) from: Increased rate of respiration leads to {increased carbon dioxide concentration/ more carbon dioxide produced} (1) Bohr effect (1) Increased carbonic acid concentration (1) Leads to increase in H^+ concentration / increased acidity (1) Decrease in affinity of haemoglobin for oxygen/ more oxygen released from oxyhaemoglobin (1)	2	2		4		
				Question 3 total	**5**	**6**	**0**	**11**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		{The number of different species/ species richness} and {the number of individuals of each species/ species evenness}. (1)	1			1		
		(ii)		Any **four** (×1) from: A. Place two tape measures at right angles to form the axes of a grid (1) B. (Use a calculator/ computer to) generate random coordinates (1) C. Place (the corner of) the quadrat at the point indicated on the grid(1) D. {Identify/ record/ count} each plant species and the number within the quadrat (1) Accept count the number of each species E. Repeat and calculate a mean	4			4		4
		(iii)		Any **two** (×1) from: Ensures samples are representative of whole area (1) Ensures reliability of results (1) Avoids bias (1)		2		2		2
		(iv)		Sample an area where grazing has not been excluded (1) Ensure {environmental conditions/ named condition} are the same for both areas (1) 2nd marking point is linked to 1st marking point			2	2		2
	(b)	(i)		Calculation diversity index = 0.63= 3 marks If incorrect award 2 marks for not rounding = 0.63202688 If incorrect award 1 mark for each of Calculation of N(N-1) =8 930 Calculation ∑n(n-1) =3 286		3		3	3	
		(ii)		Excluding grazing resulted in a reduction in biodiversity			1	1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			Reference to data from table with regard to height of plants e.g. *E. cinerea* grows up to 60cm in height / *G. saxatile* only grows up to 20cm (1) Preventing light reaching the smaller plants / Fewer small plants grow due to competition by heather (1) Causing {a reduction in the numbers of some species / species richness}/ elimination of *Galium saxatile* (1)			3	3		
				Question 4 total	**5**	**5**	**6**	**16**	**3**	**8**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Spiracle **and** trachea (1)	1			1		
	(b)	(i)		Earthworm gas exchange surface is not in contact with all cells so needs {haemoglobin/ a pigment} to transport oxygen (1) Gas exchange surface in insect is in contact with muscle cells so no transport is needed (1)	2			2		
		(ii)		Any **one** (x1) from To grow larger, {trachea / tracheoles} need to be longer / greater diffusion distance to respiring cells (1) Diffusion would be too slow to provide sufficient oxygen to respiring cells (1) More tracheoles, more chitin, more mass – too heavy (1)		1		1		
	(c)			Diameter of tracheole in μm = 4.9 or 5.0 or 5.1 μm = 2 marks If incorrect award 1 mark for: 5		2		2	2	2
	(d)	(i)		Any **three** (x1) from: (Thin gas exchange surface –) reduces diffusion distance (1) (High blood pressure –) increased flow rate (1) to maintain concentration gradient (1) increases rate of diffusion (1)	1	2		3		
		(ii)		Unable to pump water over gills so must force water over the gills by swimming with their mouths open/ must use ram ventilation (1) Maintains concentration gradient (1) Sufficient oxygen absorbed to maintain {the high rate of respiration/ ATP production for muscle contraction} (1)		1	2	3		
	(e)			A <u>temperature</u> {gradient/ difference} is maintained/ equilibrium is never reached (1) Across the length of the heat exchanger (1)		2		2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(f)			Higher kinetic energy so oxygen diffuses more quickly (into muscle) (1) Maintains {a higher rate of metabolism in the muscle / optimum temp for enzymes}/ higher rate of ATP production (1) {Can hunt for food/ remain active} in deeper, colder water (1)			3	3		
				Question 5 total	**4**	**8**	**5**	**17**	**2**	**2**

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
6	Photomicrograph A • Upper epidermis clear to allow light to penetrate • Palisade mesophyll with many chloroplasts • Spongy mesophyll with air spaces for gas exchange • Lower epidermis has stomata to allow gases to diffuse into leaf. • Orientation of palisade cells • Xylem transports water for photosynthesis Photomicrograph B • Xerophyte • Lives in a dry conditions Adaptations to reduce water loss include • Leaf rolled to reduce air movement • Hairs trap moist air around stomata • Thick waxy cuticle reduces water loss through evaporation • Sunken stomata Photomicrograph C • Hydrophyte • Lives in water • Large air spaces in spongy mesophyll for buoyancy • Stomata on upper surface {to allow gases to diffuse from air/ lower surface is immersed in water} • Waxy cuticle is thin/ absent as water loss not an issue						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Indicative content of this level is… Detailed description of the structural features of the A in relation to photosynthesis Detailed explanation of xerophytic adaptations of leaf B Detailed explanation of hydrophytic adaptations of leaf C *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… Any two from: Description of leaf structure Explanation of adaptations of xerophyte Explanation of adaptations of hydrophyte *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.*						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-3 marks Indicative content of this level is… Brief description of leaf structure OR Brief explanation of adaptations of xerophyte OR Brief explanation adaptations of hydrophyte *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	**5**	**4**	**0**	**9**		

COMPONENT 2: BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	8	1	**12**	1	0
2	5	2	3	**10**	0	2
3	5	6	0	**11**	2	0
4	5	5	6	**16**	3	8
5	4	8	5	**17**	2	2
6	5	4	0	**9**	0	0
TOTAL	**27**	**33**	**15**	**75**	**8**	**12**