GCE AS MARKING SCHEME

SUMMER 2016

BIOLOGY - COMPONENT 2
B400U20-1

INTRODUCTION

This marking scheme was used by WJEC for the 2016 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 BIOLOGY
COMPONENT 2 – Biodiversity and Physiology of Body Systems

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.

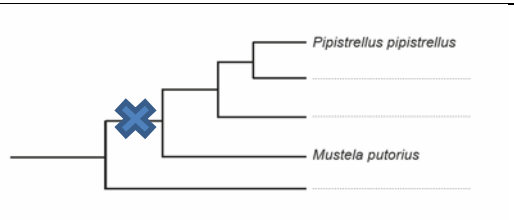
Marking abbreviations

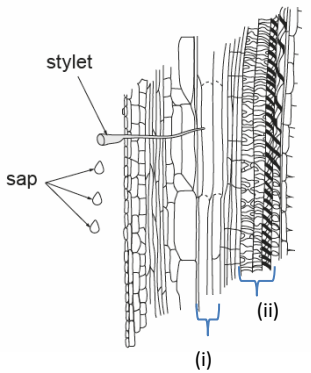
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

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)		Any one from: • {(Bi)concave shape/ or description of}/ • no nucleus / • thin / • flexible • contains haemoglobin (1)	1			1		
		(ii)		(at sea level) more red blood cells mean more oxygen can be delivered (to the muscles) (1)	1			1		
	(b)	(i)		Any three from: • CO_2 enters rbc because {CO_2 is lower inside than outside / by diffusion} (1) • (Combines with water) to form carbonic acid (H_2CO_3) (1) • (due to) presence of carbonic anhydrase inside red blood cells (1) • carbonic acid dissociates into hydrogen (ions) and hydrogen carbonate (ions) (1)	3			3		
		(ii)		• The {H^+/ hydrogen ions} from (the dissociation of carbonic acid) combine with (oxy-)haemoglobin/ lowers the pH/ forms haemoglobinic acid(1) • It {displaces/ releases} the oxygen / lowers affinity of haemoglobin (for oxygen) (1) H^+ displaces oxygen from haemoglobin = 2 marks	2			2		
				Question 1 total	**7**	**0**	**0**	**7**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			• Polecat (*Mustela putorius*) and bat (*Pipistrellus pipistrellus*)are (more closely related) (1) • They are both carnivores/ ref to eating meat or prey/ in the order carnivora (1) • Correct reference to dentition e.g. presence of {canines/ sharp incisors/ carnassials/ pointed molars} (1) Accept reference to dormouse having flat molars/ diastema/ absence of canines		1 1 1	1	3		
	(b)	(i)		noctule		1		1		
		(ii)		Should use at least 4 pulses to gain two marks Accept figures in range 40-45 = 2 marks Award 1 mark if number of pulses/ time is seen but incorrect answer (reject number of pulses higher than 10)		2		2	1	1
	(c)			514 (1) Accept 512 if justified by start and stop codons (Divide by 3) because 3 {bases/ nucleotides} <u>code for</u> one amino acid/ it is a triplet code (1) Reject 3 bases make up one amino acid Ref to base pairs = neutral	2			2	1	
	(d)	(i)		*Pipistrellus (pygmea)* (1) *Plecotus (auritus)* (1) *Muscardinus (avellanarius)* (1)		3		3		
		(ii)		Accept answers in the range 80-84			1	1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(d)	(iii)		 **X** placed anywhere on line shown above		1		1		
				Question 2 total	**2**	**9**	**2**	**13**	**2**	**1**

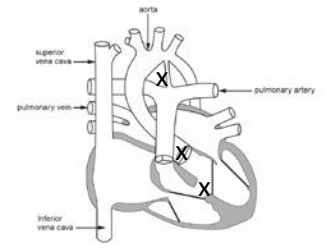
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			 (i) Phloem sieve tube correctly labelled (1) (ii) Xylem vessel correctly labelled (1)				2		
	(b)			• because mass flow is from {sources to sinks/ one direction/ same direction} (1) Reject down unqualified • this flow is {two way / bidirectional / up and down/ in both directions } (in the sieve tubes/ in the phloem) (1) • named alternative hypothesis e.g. cytoplasmic streaming / electro-osmosis / active phloem loading / diffusion/ active transport/ protein filaments (1)	1 1	1		3		
	(c)	(i)		(The mean) time for radioactivity (which moves upwards) is less (than the mean time for fluorescence which moves downwards)/ it took longer to reach maximum value in fluorescence Reject values alone without an attempt at comparison Reference to standard deviation = neutral			1	1	1	1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		1. The results for fluorescence are more {consistent/ repeatable / reliable}/ show less variation/ show less deviation from the mean/ ORA (1) 2. The standard deviation for the radioactivity results is larger than the standard deviation for the fluorescence results (even though the mean is smaller) (1) Accept ref to higher or longer Use of data is neutral Reject marking point 2 if candidate has stated results for fluorescence are less consistent or radiation more consistent			2	2	2	2
		(iii)		**Any 2 (x1) from:** • (The method is not precise because) the smallest difference which can be measured is 20 minutes (the time intervals samples taken) (1) • Attaching a label to the sucrose might affect {the rate of transport/ uptake by leaf} (1) • (reciprocal) experiment with radioisotope above and fluorescent below was not carried out (1) • Reference to variability in aphids/ plants e.g. age/ size of leaves/ species of plants/ size of stylet (1)			2	2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	*(d)*			Volume exuded by 50 tubes in 6 hours = 0.015 mm^3 Volume exuded by 1 tube in 1 hour = $\frac{0.015}{6x50}$ (1) = 5 $x10^{-5}$ (1) 2 marks for correct answer in correct standard form If incorrect Award 1 mark for 0.00005 or Award 1 mark for sight of = $\frac{0.015}{6x50}$		2		2	2	
				Question 3 total	**4**	**3**	**5**	**12**	**5**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		7 (1) A smaller number would mean missing species (1) A larger number will { not improve results/not provide more meaningful results/ take longer} (1)		2	1	3	1	1
		(ii)		**Any 2(x1) from:** Mark out a grid in the wood/use tape measures at right angles/ or description of (1) Use random number {generator/dice/ table} (1) to pick coordinates/ or description (1)	2			2		2
	(b)	(i)		Calculation of N(N-1) =14X13=182 (1) Calculation of ∑n(n-1) = 28 (1) Calculation of Diversity Index = 0.85 to 2 places of decimal (1) Correct answer = 3 marks		3		3	3	3
		(ii)		(Diversity index is greater in coppiced area) The effect of coppicing is to {increase biodiversity/ increase number of species/ increase in number of individuals/ increase species {richness/ evenness}}. Accept {improves/ higher/ beneficial} as alternatives for increase Allow ECF from (i) if answer is less than 0.62			1	1		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			Coppicing has {eliminated/ killed off} Dog's Mercury (1) Reject reduced/ extinct/ not found Coppicing has allowed more {light / water} through/ coppicing results in less shade(1) Accept no trees to climb/need trees to grow on Reject to survive In higher levels of light other plants {are better adapted/out-compete Dog's Mercury}/ Dog's Mercury cannot survive in high light intensity(1)			3	3		
				Question 4 total	**2**	**5**	**5**	**12**	**4**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		absorbance/ light absorbed Accept absorption Reject 'absorption of red or infra- red light'			1	1		
		(ii)		0% = 0.26 100% = 0.02			1	1		
		(iii)		Reference to level of oxygen in {blood/ body}		1		1		
	(b)			In single systems there one circuit in double system there are two (separate) circuits /blood passes through heart once compared with twice (1) It allows (oxygenated) blood to be delivered (to organs) under (high) <u>pressure</u>/ there is no sustained drop in <u>pressure</u> (after passing through lungs) (1)	2			2		
	(c)	(i)		Labels pointing to any two from:  hole between the right and left ventricles (1) connection between the pulmonary artery and the aorta (1) aortic valve should be three cusps (1)		2		2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	*c*	(ii)		Oximeter will detect less oxygenated /blood containing less oxyhaemoglobin/give a lower reading (for % sat)/ ORA (1) Any two from: • (The hole in the septum will allow) deoxygenated blood (from right ventricle) to mix with oxygenated blood in (left ventricle)/ aorta) (1) Must not be in incorrect context • The connection will allow deoxygenated blood into aorta/ allows deoxygenated and oxygenated blood to mix (1) • Faulty valve will allow backflow of blood into the <u>left</u> ventricle (1)		1 1	1	3		
				Question 5 total	**2**	**5**	**3**	**10**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Any three (x1) from: 1. Reference to active site of α amylase/ lock and key hypothesis/ ref to enzyme substrate complexes (1) 2. complementary shape only to starch (not cellulose)(1) 3. Starch contains α glucose but cellulose contains β glucose/ reference to α bonds and β bonds (1) 4. Reference to {coiling in starch /straight chains in cellulose/ microfibrils in cellulose/ cross linking in cellulose / alternate (glucose) molecules rotated by 180^0 in cellulose/ molecules not rotated in starch (1)	3			3		
		(ii)		Reference to the {enzyme/ cellulase} being produced by {bacteria/ micro-organisms}		1		1		
	(b)	(i)		Food substance — Reagent Starch — Iodine (solution)/ (Potassium) iodide (1) Reducing sugar — Benedict's (reagent) (1)	2			2		2
		(ii)		Soft faeces contain <u>more</u> (reducing) sugar (than hard faeces) Accept named reducing sugar reject nutrients/ starch		1		1		1
		(iii)		(Soft faeces) would {taste/ smell} <u>sweeter/</u> ORA		1		1		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			1. Small intestines come before the caecum in the digestive system (1) 2. (When eating grass) cellulose digestion takes place after absorption so sugar is {not absorbed/ passed out in soft faeces} (1) Reject nutrients 3. When eating soft faeces the food is passing through the alimentary canal a second time (1) 4. After eating the soft faeces the {sugar/ nutrients} can then be absorbed (1)		4		4		
				Question 6 total	**5**	**7**	**0**	**12**	**0**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7			I	• large surface area due to presence of gill filaments/ plates/ lamellae • permeable • rich blood supply to maintain concentration gradient between water and blood • reduced diffusion distance • ventilation mechanism						
			II	• separate buccal and opercular/gill cavities • operculum/bony plates can close gill cavity • lowering floor of buccal cavity increases volume and decreases pressure in buccal cavity • mouth opens and water enters • mouth closes floor of buccal cavity is raised • increased pressure forces water over the gills	5	4		9		
				• water and blood flow in opposite direction – countercurrent flow • maintain a concentration gradient for O_2 across whole of gill surface • O_2 absorption is more efficient/ blood and water do not reach equilibrium/more O_2 is absorbed						
			III	• Axolotls have external gills so no ventilation mechanism/rely on water currents/whole body movements to ventilate gills • Reference to parallel flow • Cannot absorb as much / less efficient at O_2 absorption which is needed for aerobic respiration						
				Question 7 total	**5**	**7**	**0**	**12**	**0**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Detailed explanation of properties of gas exchange surfaces. Detailed explanation of ventilation including reference to pressure/ volume **and** counter current mechanism in fish. Explanation of slower movement in axolotl. *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** Any two from: Explanation of properties of gas exchange surfaces Explanation of ventilation and counter current mechanism in fish Explanation of slower movement in axolotl *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 Any one from: Description of properties of gas exchange surfaces Description of ventilation **or** counter current mechanism in fish Attempt at explanation of slower movement in axolotl *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	**5**	**4**	**0**	**9**	**0**	**0**

COMPONENT 2: BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	7	0	0	7	0	0
2	2	9	2	13	2	1
3	4	3	5	12	5	3
4	2	5	5	12	4	6
5	2	5	3	10	0	0
6	5	7	0	12	0	3
7	5	4	0	9	0	0
TOTAL	27	33	15	75	11	13