GCE A LEVEL MARKING SCHEME

SUMMER 2023

A LEVEL
BIOLOGY – COMPONENT 2
A400U20-1

© WJEC CBAC Ltd.

INTRODUCTION

This marking scheme was used by WJEC for the 2023 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 CBAC Ltd.

EDUQAS GCE A LEVEL BIOLOGY

COMPONENT 2: CONTINUITY OF LIFE

SUMMER 2023 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.

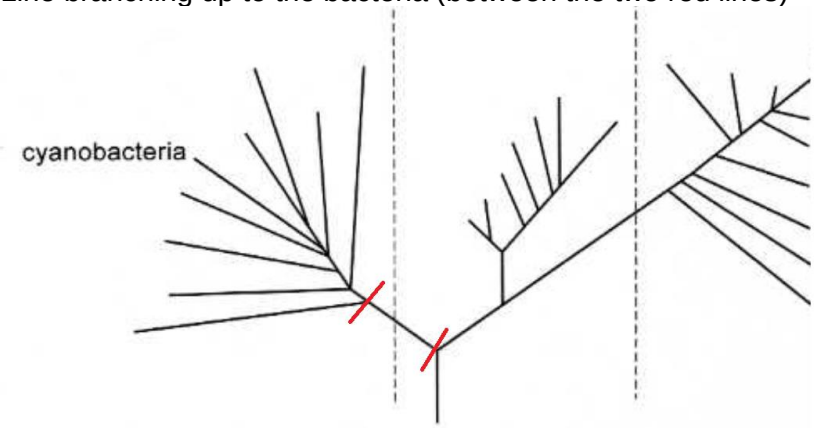
© WJEC CBAC Ltd.

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

© WJEC CBAC Ltd.

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		Intracellular	1			1		
		(ii)		Capsid/ capsomeres/ protein coat	1			1		
		(iii)		Line branching up to the bacteria (between the two red lines)  		1		1		
	(b)	(i)		Contains photosynthetic pigment/ photosynthesis takes place (1) Oxygen is produced (which inhibits nitrogen fixation) (1) MP2 linked to MP1		1	1	2		
		(ii)		No {nucleus/ mitochondria/ golgi/ e.r/ chloroplasts}/ {smaller /70s} ribosomes/ murein cell wall/ peptidoglycan cell wall/ have plasmids Reject no membrane bound organelles	1			1		
				Question 1 total	**3**	**2**	**1**	**6**	**0**	**0**

© WJEC CBAC Ltd.

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			water entered (the cells) (1) by osmosis (1)			2	2		2
	(b)	(i)		**Any two (x1) from** • To give a single layer of cells/ To prevent the tissue/cells building up in several layers/moving over each other (1) • allowing light to pass through (1) • Prevent {damage/ distortion} of cells (1)		2		2		2
		(ii)		{More/ most} cells in {interphase/ this phase} (than any other phase)/ fewer cells in mitosis/ fewer cells with chromosomes visible		1		1		1
		(iii)		F **and** {chromatids (allow chromosomes) pulled to (opposite) poles/ it is in anaphase}		1		1		1
				Question 2 total	**0**	**4**	**2**	**6**	**0**	**6**

© WJEC CBAC Ltd.

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Same everywhere/universal/ common name is localised/ owtte (1) Genus name indicates {evolution/ relatedness}/ owtte (1)		2		2		
	(b)	(i)		**Male gamete** 8 (1) Formed by meiosis of pollen mother (grain)/ {generative/ pollen grain} nucleus divides by mitosis (1) **Primary endosperm nucleus** 24 (1) Formed by fusion of 3 haploid nuclei/ (one) male {nucleus/ gamete} fuses with (two) polar nuclei (1) **zygote** 16 (1) Formed by fusion of {2 haploid nuclei/ male and female gamete} (in embryo sac before fertilisation) (1)		2 2 2		6		
		(ii)		Zero (1) Have no nucleus (1)	2			2		
		(iii)		(integuments) forms the {testa/ seed coat}	1			1		
	(c)			{Inhibits/ reduces} {root/ growth} of (nearby) plants (1) Reducing competition (1)			2	2		
				Question 3 total	**3**	**8**	**2**	**13**	**0**	**0**

© WJEC CBAC Ltd.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Sertoli cells (1) providing {nourishment/ protection} (1)	2			2		
		(ii)		**Any three (x1) from** • Mitosis produces large numbers of (primary) spermatocytes (1) • Meiosis produces {haploid/ owtte} {spermatids/ spermatozoa/ cells} (1) • Meiosis needed for genetic variation/ genetically different cells/ owtte (1) • Large numbers (of spermatozoa) to increase chance of fertilisation (1)	3			3		
	(b)	(i)		{Leydig/ interstitial} cells	1			1		
		(ii)	I	Far more Hydrogen than Oxygen/ too many Hydrogen compared to Oxygen/ contains {C=C / Carbon carbon double bond}/ too few oxygen compared to carbon/ does not follow $C_nH_{2n}O_n$ pattern	1			1		
			II	No Nitrogen/ proteins contain nitrogen/ No {amine/ amino/ NH_2} group	1			1		
	(c)			16 minutes = 3 marks If incorrect award 2 marks 15.63 (not rounded) If incorrect award 1 marks 160 000 (working out number of sperm per minute)		3		3	3	

© WJEC CBAC Ltd.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		Golgi (body/apparatus)	1			1		
		(ii)		(they both) decrease (1) Makes them more streamlined/ more can be fitted into a small space. (1)		1	1	2		
		(iii)		Prevents {it hydrolysing sperm contents/ autolysis}			1	1		
	(e)	(i)		• Acrosin is needed for fertilisation to occur if zona pellucida present/ no acrosin results in no fertilisation with {normal ova/ with zona pellucida} Acrosin not needed if no zona pellucida present (1) • Acrosin {hydrolyses/breaks} down the zona pellucida (1) • Acrosin doesn't always fully break down the zona pellucida (1)			3	3		3
		(ii)		Fallopian tube/ oviduct	1			1		
		(iii)		Binds {to a place on acrosin away from the active site/at allosteric site} (1) Changes the {shape/ structure} of the <u>active site</u> (1) Prevents it hydrolysing zona pellucida (1)	2	1		3		
				Question 4 total	**12**	**5**	**5**	**22**	**3**	**3**

© WJEC CBAC Ltd.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Ribose v deoxyribose (1) Uracil v thymine (1)	2			2		
		(ii)		(The 20-base sequence) may occur at other places in the {genome/ DNA/ chromosome}		1		1		
		(iii)		**Any three (x1) from** • gRNA with sequence complementary to recessive allele used (1) • Cuts recessive allele. (1) Reject cuts <u>out</u> • Functional allele is placed into {defective / faulty} allele (1) • Using ligase (1)		3		3		
		(iv)		**Any two (x1) from** Can be passed on to future generations/ inherited (1) Present in all cells of the body (1) Does not need to be repeated (1)	2			2		
	(b)	(i)		1.003×10^3 mm or 1.00×10^3 mm (3 marks) If incorrect award 2 marks for 1 003 000 (µm) 1.003×10^6 (µm) 1003 (mm) If incorrect award 1 mark for 2.95×10^6 X 0.34 = (length in µm)		3		3	3	
		(ii)		also DNA in the <u>mitochondria</u>		1		1		
				Question 5 Total	**4**	**8**	**0**	**12**	**3**	**0**

© WJEC CBAC Ltd.

<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>6</td><td>(a)</td><td></td><td></td><td>Any three (x1) from
{Anthers/ stamen} removed (1)
Pollen transferred by hand (1)
(Recipient) flower is isolated/ method of isolation e.g. in a bag (1)
The male and female parts are separated (1)</td><td></td><td></td><td>3</td><td>3</td><td></td><td>3</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td>
<table>
<tr><th>Phenotype</th><th>Observed number (O)</th><th>Expected number (E)</th><th>O-E</th><th>$(O-E)^2$</th><th>$(O-E)^2/E$</th></tr>
<tr><td>Glossy, green leaves</td><td>64</td><td>40</td><td>24</td><td>576</td><td>14.4</td></tr>
<tr><td>Glossy, green and white striped leaves</td><td>12</td><td>40</td><td>-28</td><td>784</td><td>19.6</td></tr>
<tr><td>Rough, green leaves</td><td>11</td><td>40</td><td>-29</td><td>841</td><td>21.03</td></tr>
<tr><td>Rough, green and white striped leaves</td><td>73</td><td>40</td><td>33</td><td>1089</td><td>27.23</td></tr>
</table>
χ^2 = Accept 82.25 or 82.26 = 3 marks
Award 2 marks for
82.2 or 82.3
If incorrect award 1 mark for each of
expected number = 40
correct $(O-E)^2/E$ column</td><td></td><td>3</td><td></td><td>3</td><td>3</td><td>3</td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>3</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td>1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>Less than 0.01</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td>1</td></tr>
</table>

© WJEC CBAC Ltd.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iv)		There is a significant difference between the observed and expected {numbers /results}/ Results are not due to chance (1) Null hypothesis should be rejected (1)		2		2		
		(v)		**Any four (x 1) from:** A. The genes are {linked /on the same chromosome} / autosomal linkage (1) B. {Large number/ more} of {non-recombinants/ glossy green **and** rough striped}/ owtte (1) C. {Small number/ less} of {recombinants/ glossy striped **and** rough green}/ owtte (1) D. From crossing over {in meiosis 1/prophase 1} (1) E. Between homologous chromosomes (1)			4	4		
				Question 6 total	**0**	**7**	**7**	**14**	**5**	**8**

© WJEC CBAC Ltd.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		Some contained more than 1 type of prey Accept some snakes ate more than one prey item			1	1		1
		(ii)		**Any three (x1) from** • {Only some/not all} of the snakes regurgitated prey (1) • Some of the prey may have already been digested so accurate {mass/circumference/identification} is not possible. (1) • The snakes did not need to be killed (1) • Snakes may have been distressed by handling (1) • Use dry mass of prey as may contain bodily fluids (1) • diet may vary over time (1)			3	3		3
		(iii)		**Any three (x1) from:** Island: larger mass / heavier/ ORA for mainland (1) Island: larger circumference/ ORA for mainland (1) Mainland has more types of prey/ ORA for island (1) Both eat mice (1) Island has wider range of {mass/ circumference} (1)		3		3		
		(iv)		Accuracy: close to true value (1) Reliability: little variation around mean/ owtte / results are repeatable/ consistency of results (1)	2			2		2
		(v)		Size of {prey/ mice} (given)/ large and small (mice)		1		1		1
		(vi)		Allows comparison (1) jaw length at hatching different/ (1)		2		2		2

© WJEC CBAC Ltd.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(vii)	I	Mainland groups (A and B) had {no/ small/ only 0.27mm} difference in mean jaw length (at maturity) / group C are larger than group A (1)			1	1		
			II	jaw length increased when large {prey/ mice} was given/ group D jaw length was larger than group C/ group B jaw length was larger than group A (1)			1	1		
	(b)	(i)		A. (Island groups) geographically isolated (from mainland)/ allopatric speciation/ physical barrier (1) B. Each group had (different) selection pressures/ ref to different {mass/ circumference} prey (1) C. {Those with selective advantage/ survivors} {breed/ reproduce} and pass on allele (for characteristic) (1)	1	2		3		
		(ii)		No longer able to interbreed and produce {viable/ fertile} offspring	1			1		
				Question 7 total	**4**	**8**	**6**	**18**	**0**	**9**

© WJEC CBAC Ltd.

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
8	**Indicative content** OESTROGEN A1 Developing follicles secrete oestrogen; A2 {Increased/high levels} of oestrogen A3 (Oestrogen) {inhibits/ reduces} FSH (release)/ ref to negative feedback on FSH; A4 (Oestrogen) stimulates LH (release)/ ref to positive feedback on LH A5 LH causes ovulation. PROGESTERONE B1 When progesterone is stopped, {FSH/LH} inhibition is removed /progesterone inhibits {FSH/LH} B2 FSH released/ increased B3 so follicles {develop/ mature} B4 LH released B5 So ovulation occurs CONTROL and PROBLEMS C1 know when it is best to introduce the male/ artificially inseminate/ to increase chance of fertilisation C2 To increase the stock of lambs/ more meat C3 lambs all born around the same time/ ready for market at the same time C4 Hormone may be present in meat (that may be eaten by Humans) C5 Hormones may be toxic / have an unknown effect in humans/ may affect human female menstrual cycle/ alter fertility C6 Stress/ injury to sheep during injection	4	3	2	9		

© WJEC CBAC Ltd.

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
	7-9 marks Indicative content of this level is detailed statements from all three areas of the indicative content. *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 statements from two areas of the indicative content. *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 any correct statement from the indicative content. *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	**4**	**3**	**2**	**9**	**0**	**0**

© WJEC CBAC Ltd.

COMPONENT 2: CONTINUITY OF LIFE

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	2	1	**6**	0	0
2	0	4	2	**6**	0	6
3	3	8	2	**13**	0	0
4	12	5	5	**22**	3	3
5	4	8	0	**12**	3	0
6	0	7	7	**14**	5	8
7	4	8	6	**18**	0	9
8	4	3	2	**9**	0	0
TOTAL	**30**	**45**	**25**	**100**	**11**	**26**

© WJEC CBAC Ltd.