GCSE MARKING SCHEME

SUMMER 2023

GCSE
BIOLOGY - UNIT 2
3400U20-1 AND 3400UB0-1

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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.

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WJEC GCSE BIOLOGY – UNIT 2

FOUNDATION and HIGHER

SUMMER 2023 MARK SCHEME

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 statements.

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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

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FOUNDATION TIER

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Receptor (1) Retina (1) Light (1) Electrical (1)	4			4		
	(b)			C Reflex	1			1		
	(c)			Protect(ive) (1) Fast/ rapid (1)	2			2		
				Total for question 1	**7**	**0**	**0**	**7**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	prac
2	(a)	(i)		D			1	1		
		(ii)		Auxin	1			1		
	(b)	(i)		Drawing to show – Increase in length of root (ignore incorrect direction or shape) (1) In (finally) downward direction (1)			2	2		2
		(ii)	I	(Positive) Gravitropism (1) Accept geotropism/ gravitropic response	1			1		1
			II	(to obtain) water/ minerals/ nutrients (1)		1		1		1
				Total for question 2	**2**	**1**	**3**	**6**	**0**	**4**

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Question				Marking details	Marks					
					AO1	AO2	AO3	Total	Maths	prac
3	(a)	(i)		Correctly placed Base (1) Sugar (1) and phosphate (1) (either way around)	3			3		
		(ii)		Double helix	1			1		
	(b)			Cut into small pieces	1			1		
	(c)	(i)		Three bands from mother correctly shown – 3, 8 and 12(1) (circles may include bands from mother and baby)		1		1		
		(ii)		Man C (1) Only he has the <u>three</u> {<u>other / non-mother</u>} bands/ He has bands 2, 10 and 11 (1)			2	2		
		(iii)		**Any one (×1) from:** Criminal /forensic investigations/ identifying individuals (1) Identifying relationships between species/ classification (1) Identifying genes related to diseases / individuals at risk of diseases (1)	1			1		
				Total for question 3	**6**	**1**	**2**	**9**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Kingdom – Animal(ia) (1) Genus – **T**rachemys (1) Species – **s**cripta (1)		3		3		
	(b)	(i)		25 (mm / year) = 2 marks If incorrect award 1 mark for (300 – 50) /10		2		2	2	
		(ii)		Need too much space / {to provide sufficient food / cost of food} / to difficult to {handle/pick up)			1	1		
	(c)			(table*)* *False (given*) False True True True Accept T and F if clearly written Four correct = 3 marks Three correct = 2 marks One/ two correct = 1 mark		3		3		
	(d)			They use the {scientific name /Latin name / its genus and species/ *Trachemys scripta /* binomial name/ specific name}.	1			1		
				Total for question 4	**1**	**8**	**1**	**10**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	prac
5	(a)	(i)		2 (1) 16 (1) 8 (1)		3		3		
		(ii)	I	Growth/ repair of tissue / replacement of cells Allow repair unqualified but reject repair of cells	1			1		
			II	Gametes/ sex cells/ eggs/ sperms	1			1		
	(b)			<u>Genes on the chromosomes are different</u>			1	1		
				Total for question 5	**2**	**3**	**1**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		No unwanted bacteria (from forceps) / avoid contamination/ kills bacteria (on forceps)		1		1		1
		(ii)		{Close/ shut} the petri dish and {tape /seal}/ put the lid on and {tape /seal}/ cover and {tape /seal}		1		1		1
	(b)			$25^{o}C$	1			1		1
	(c)	(i)		380 = 3 marks If incorrect award 2 marks for 381 / 379.9 (rounded incorrectly) 379.94 (not rounded) 380.1327… (using π from calculator) Award 1 mark for 121 x 3.14/ π, seen anywhere in the working Allow answers which are not written in the table.		3		3	3	3
		(ii)	I. II.	Scale on y axis (1) Three bars with correct heights (+/- one small square) and labelled = 2 marks Two bars correct and labelled – 1 mark Allow ecf from the table Ignore any uneven width of bars		1 2		3	1 2	3

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Antibiotic D (1) {Largest/ biggest} clear area (1) where bacteria have been {killed/ destroyed/ have been prevented from growing} (1) Allow ecf from bar chart.			1 1 1	3		3
	(d)	(i)		Ask another {student/ scientist} to repeat the (same) experiment / compare results with another {group/ scientist} reject repeat unqualified			1	1		1
		(ii)		{Wider range/different} antibiotics / different (types of) bacteria/ different concentrations of antibiotics / different incubation temperatures			1	1		1
				Total for question 6	**1**	**8**	**5**	**14**	**6**	**14**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			A: sweat duct (1) B: sweat gland (1)	2			2		
	(b)			**Indicative content** 1. Increased volume of sweat/ more sweat 2. Sweat passes {through pore/ through duct/ onto skin surface} 3. Evaporation 4. Erector muscle 5. (Erector muscle) relaxed 6. Hair lies flat / less trapped air /less insulation 7. Vasodilation/ Blood vessel diameter {increases/widens} 8. Blood flow (to the skin) {increased / altered} 9. Heat is lost (from blood) **5-6 marks – 7 or more points of indicative content.** *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks – 4-6 points of indicative content** *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks – 1-3 points of indicative content.** *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks:** *No attempt made or no response worthy of credit.*	3	3		6		
				Total for question 7	**5**	**3**	**0**	**8**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/1	(a)	(i) (ii)		Medulla label correct (1) Renal artery label correct (1) Accept labelling of (i) and (ii) if clearly shown Arrow clearly pointing to /touching structure	2			2		
	(b)	(i)	I	Protein **×** Urea ✓ **Both correct = 1 mark**		1		1		
			II	Urea		1		1		
			III	glucose present (in the urine) Ignore neutral references to other substances also being present.			1	1		
		(ii)	I.	Add Benedict's (reagent) (1) Heat/ boil (1) {Green/ yellow/ orange/ red} colour (showing glucose present) (1)	1 1	1		5		5
			II.	Add biuret (reagent) (1) Remains blue (as protein not present) (1) Ecf from table	1	1				

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Risk: transfer of chemical to skin when {placing sample into tube/ using liquids/ owtte} /transfer to eye from hand **And** Control measure: Wear protective gloves/eye protection / wash hands Control measure must match risk. **Both correct = 1 mark**	1			1		1
				Total for question 8/1	**6**	**4**	**1**	**11**	**0**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/2	(a)			Two protein coats **and** membrane (present) (accept reference to a *cell* membrane.)		1		1		
	(b)			Relevant ref. to blood / body fluids/ sexual transmission (1) Example of barrier from spec guidance – sexual transmission – condoms / stop transfer of body fluids – wear gloves (1) Do not credit "use contraception"	1 1			2		
	(c)	(i)		<u>97%</u> treated (with HAART) (1)			1	1		
		(ii)		(HAART) effective at reducing number of people {with (AIDS) symptoms / dying (from AIDS)} (1)				1		
	(d)	(i)		19 %		1		1		
		(ii)		45724 or 45724.5 or 45725 = 2 marks If answer incorrect 45/100 x 101 610 = 1 mark		2		2	2	
		(iii)		{Greater %/ majority} of people with infections over 35 (than under 35) Or Under 35 = only 20% of infections/ over 35 = 80% of infections Or Relevant comparison with selected older group eg under 35 = 20% infections but 35 – 49 =45% of infections Or The highest percentage of infections are in the 35 – 49 age groups			1	1		
				Total for question 9/2	**2**	**4**	**3**	**9**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Negative feedback (1) Homeostasis = neutral	1			1		
		(ii)		Optimum (temperature) for {enzymes / metabolism} / {enzymes / metabolism} work within a narrow range (of temperatures) (1)	1			1		
		(iii)		Vasodilation/ or description of (1) More blood <u>to {skin/ surface}</u> {to carry heat away / release heat} (1) OR Erector muscles relax / hair lie flat (1) {no / less} insulating layer <u>of air</u> (next to skin) / thinner layer <u>of air</u> so <u>more</u> heat is lost (1)		2		2		
				Total for question 3	**2**	**2**	**0**	**4**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		(Positive) gravitropism/ geotropism (1) Reject negative gravitropism		1		1		1
		(ii)		Auxin (1)	1			1		1
	(b)			• {Root/ it} (grows) {straight / horizontal}(1) • (Force of) gravity {is equal on/ affects} all sides (of germinating root)/ owtte direction of gravity is constantly changing/ auxins are spread equally (1)		1	1	2		2
	(c)			To show the effect was only because of gravitropism / to test only one variable/ eliminate the effect of light/ prevent phototropism (1)			1	1		1
				Total mark for question 4	**1**	**2**	**2**	**5**	**0**	**5**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		An {undifferentiated/ unspecialised} cell with the ability to {differentiate into / specialise into/ become} {another type of cell/ a specialised cell} (1)	1			1		
		(ii)		Mitosis Correct spelling only		1		1		
		(iii)		(Use of adult stem cells have) {fewer/ no} ethical issues/ no embryos destroyed)/ ORA (some people believe that) using embryonic stem cells destroys a potential life/ ORA (1) Reject reference to rejection		1		1		
		(iv)		**Any two (×1) from:** pH (1) temperature (1) Ignore heat nutrients (1) Ignore nutrition oxygen (1) Ignore air pressure (1)			2	2		
	(b)			Humans do not have the right to subject animals to any form of experimentation/ animals are {killed/ harmed}/ animals are unable to give consent (1) Ignore cruel unqualified	1			1		
				Total mark for question 5	**2**	**2**	**2**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		**Any two (×1) from:** {Forceps/ equipment used to place disc} {sterilised/flamed/ heated} (1) Petri dish lid not raised too high (1) Working close to Bunsen burner (1)	2			2		2
		(ii)		25˚C Accept range 20-30	1			1		1
	(b)	(i)		{antimicrobials/antibiotics/solution} has {diffused/ moved} {out of the disc/ through the agar} (1) the bacteria has been {killed/ prevented from growing/ destroyed/ cannot survive} (1)		2		2		
		(ii)		{Moringa/ it} is more effective than {penicillin/ disc B}/ ORA (1) {Moringa/ it} is less effective than {tetracycline/disc C}/ ORA (1)			2	2		2
	(c)			**Any one (x1) from:** Compare their results with other students in the class/ ref to reproducibility (1) Carry out more repeats/ increase sample size (1) Reject ref to accuracy Compare a filter paper disc dipped in <u>sterile</u> water (1)			1	1		1
				Total mark for question 6	**3**	**2**	**3**	**8**	**0**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			• Use {transect/ tape / line} laid out across {sample / from high water mark to low water mark/ shore} (1) Reject capture- recapture • quadrats placed at {intervals/ 5m} (1) Reject random quadrats • number of barnacles counted/ estimate % cover/ estimate the number of barnacles (1)	1 1	1		3		3
	(b)	(i)		Any **two** (x1) from: <u>Competition</u> for food (1) Predation/ predators (1) Disease (1) Pollution (1) Temperature (1) Time out of the water/ {changing/ rising} sea levels/ tidal effects (1) Ref to currents/ waves in water (1) pH of sea (1) invasive/ alien species (1)	2			2		
		(ii)		2 : 1 2.3 : 1 2.28 : 1		1		1	1	
		(iii)		Interspecific (competition)		1		1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iv)		Yes, there are no *C. stellatus* {between 40-50m/ past 35m} **and** no *S. balanoides* {between 0-15 m/ up to 20m} OR Yes, *C. stellatus* were found {between 5 and 35m/ up to 40m} **and** *S. balanoides* were found {between 20-45m/ from 20m}. OR Yes, *C. stellatus* first found at 5m **and** *S. balanoides* first found at 20m. OR Yes. At the {40m/45m} mark there are *S. Balanoides* and no *C. stellatus* ***AND*** *a*t {5m/10m/15m} mark there are *C. stellatus* and no *S. Balanoides*			1	1		1
				Total mark for question 7	**4**	**3**	**1**	**8**	**1**	**4**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)	I	{Section/ part} of a {DNA (molecule) / chromosome} which {determines/ codes for} {characteristics/ traits/ phenotype/ protein/ sequence of amino acids}	1			1		
			II	Change in a {gene/ DNA/ chromosome/ genetic make-up/ triplet code}	1			1		
		(ii)		{DNA / genetic} profiling/ {gene/ genome} sequencing	1			1		
	(b)	(i)		(leu) – cys – ser (leu) – tyr – ser (1) (1) Mark as columns			2	2		
		(ii)		• {TGT / cysteine/ cys} changed to {TAT / tyrosine/ tyr}/ {allele/ triplet code/ order of bases} changed (1) • giving {different/ wrong} amino acid/ {different/ wrong} sequence of amino acids (1) • iron regulating protein {does not work/ not produced}/ {different/ wrong} protein is produced/ protein with different function is produced/ protein is changed (1)		3		3		
	(c)	(i)		Phenotype: {carrier/ unaffected/ normal iron/ no haemochromatosis} x {affected/ haemochromatosis/ more iron/ sufferer/ has condition} (1) Genotype: Hh x hh (1) Correct gametes (1) Correct mechanics (1)		1 1 1 1		4	2	1

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		50%/ 1/2/ 0.5 correct from Punnett square in (i)		1		1	1	
	(d)			A. (Mutation) has led to variation (1) B. {Mutant allele/ mutation} gives an {advantage/ better chance of survival}/ {people with haemochromatosis/ the (genetic) condition / description of haemochromatosis} have a better chance of surviving/ ORA (1) C. Because individuals can take in more iron (from diet) / ORA (1) D. (They reproduced and) passed (HFE) {allele/ gene/ mutation} on to next generation (1)	1 1	 1 1		4		
				Total mark for question 8	**5**	**10**	**2**	**17**	**3**	**1**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		2 marks 67 1 mark 67.114094 (1900/2831)x100		2		2	2	
		(ii)		**Any one (×1) from:** • {%/ number} dying receiving {REGN-EB3 /mAb-114} was lower than those receiving the other treatments treatment/ ora (1) Accept use of data • {%/ number} {surviving/ survival rate} receiving {REGN-EB3 /mAb-114} was higher than those receiving the other treatments treatment/ ora (1) • {%/ number} dying receiving ZMapp and Remdesivir is similar to receiving no treatment (1) • Half of the patients receiving ZMapp and Remdesivir were dying (1)			1	1		
		(iii)		patients **and** {doctors/ researchers} do not know who is receiving which drug (1) Removes bias / increases strength of evidence (1) reliability = neutral	2			2		
		(iv)		Ebola {has a high mortality / is a deadly (disease)/ owtte} / people who received a placebo would have been at a {higher risk of dying/ owtte}/ ORA (1)			1	1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			**Indicative content:** **Pre-clinical** 1. Tested on (human) {cells/ tissues} 2. Tested on {animals/ named animal} 3. Tested on <u>healthy</u> {volunteers/ people} 4. Correct sequence **Monoclonal antibody production** 5. (B lymphocyte from blood sample) <u>fused</u> 6. with {tumor cell/ myeloma} 7. Forms hybridoma 8. (Divides) to form clones 9. (clones/ hybridomas) produce {specific/monoclonal} antibodies **5-6 marks – 7 or more points of indicative content.** *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks – 4-6 points of indicative content** *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks – 1-3 points of indicative content.** *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks:** *No attempt made or no response worthy of credit.*	5	1		6		
				Total mark for question 9	**7**	**3**	**2**	**12**	**2**	**0**

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BIOLOGY UNIT 2

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES FOUNDATION

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	7	0	0	7	0	0
2	2	1	3	6	0	4
3	6	1	2	9	0	0
4	1	8	1	10	2	0
5	2	3	1	6	0	0
6	1	8	5	14	6	14
7	5	3	0	8	0	0
8	6	4	1	11	0	6
9	2	4	3	9	2	0
TOTAL	**32**	**32**	**16**	**80**	**10**	**24**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES HIGHER

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	6	4	1	11	0	6
2	2	4	3	9	2	0
3	2	2	0	4	0	0
4	1	2	2	5	0	5
5	2	2	2	6	0	0
6	3	2	3	8	0	6
7	4	3	1	8	1	4
8	5	10	2	17	3	1
9	7	3	2	12	2	0
TOTAL	**32**	**32**	**16**	**80**	**8**	**22**

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