GCSE MARKING SCHEME

SUMMER 2023

GCSE
DOUBLE AWARD SCIENCE
BIOLOGY 2 - UNIT 4
3430U40-1 AND 3430UD0-1

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.

DOUBLE AWARD SCIENCE
UNIT 4 BIOLOGY 2

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 statements.

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

<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>1</td><td>(a)</td><td>(i)</td><td></td><td>2.5</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></td><td>5 (.0)</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>(alderfly)
stonefly
dragonfly
All correct for 1 mark</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>
<table>
<tr><td>five kingdom system</td><td></td></tr>
<tr><td>are animals</td><td>True</td></tr>
<tr><td>have backbones</td><td>False</td></tr>
<tr><td>are invertebrates</td><td>True</td></tr>
<tr><td>are in the same genus</td><td>False</td></tr>
<tr><td>each have a separate species name</td><td>True</td></tr>
</table>

all five correct = 3
three/four correct = 2
two correct = 1</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td colspan="4"></td><td>Question 1 total</td><td>3</td><td>3</td><td>0</td><td>6</td><td>1</td><td>0</td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		5 = 2 marks Award 1 mark for 40/8		2		2	2	2
		(ii)	I	Number of peas in pod		1		1		1
			II	All 5 plots correct = 2 marks 4 plots correct = 1 mark 0/1/2/3 plots correct = 0 marks Tolerance < 1 small square		2		2	2	2
		(iii)		Longer pods have more peas/ ORA/ positive correlation number of peas depends on pod length (1) ecf from incorrect plots			1	1		1
		(iv)		count the peas again <u>select the plants at random</u> (1) measure pod length in millimetres <u>collect more pods from each plant</u> (1)			2	2		2
	(b)			C			1	1		
				Question 2 total	**0**	**5**	**4**	**9**	**4**	**8**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Receptors (1) Impulses (1) Neurones (1)	3			3		
	(b)	(i)		(Alcohol) slows the {rate/ speed} of reading/takes longer to read/ ora (1) increases errors/made (more) mistakes/ decreases accuracy/ ORA (1) Penalise use of 'more alcohol' once only			2	2		2
		(ii)		(Each given) same {volume/ 500cm^3} (1) (Each given) same {concentration/ 5%/ percentage} (1)			2	2		2
		(iii)		Any **one** (×1) from: Show results are due to the effect of alcohol (1) allow comparison/ to make conclusion/ to see a difference (between the groups)/ to give a baseline (1)			1	1		1
				Question 3 total	**3**	**0**	**5**	**8**	**0**	**5**

<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>4</td><td>(a)</td><td>(i)</td><td></td><td>Nucleus</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></td><td>DNA</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></td><td>3 : 1</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>I</td><td><u>Heterozygous</u></td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>II</td><td><u>homozygous recessive</u></td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td></td><td><table><tr><td>sex</td><td>X only</td><td>Y only</td><td>X or Y</td></tr><tr><td>female</td><td>✓</td><td></td><td></td></tr><tr><td>male</td><td></td><td></td><td>✓</td></tr></table>one mark for each correct row (2)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>½, half, 50/50, 0.5, 50%</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td colspan="4"></td><td>Question 4 total</td><td>4</td><td>4</td><td>0</td><td>8</td><td>1</td><td>0</td></tr>
</table>

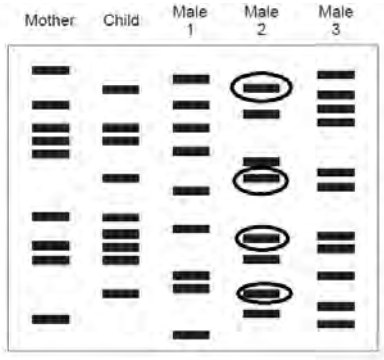
Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Any **two** (×1) from: • Ref to {disease/ infection} (1) • Ref to {bacteria/ microorganisms/ microbes/ viruses/ fungi} (1) • Ref to blood loss (1) Reference to pathogens = 2 marks	2			2		
	(b)			Penicillin /other named antibiotic (1) {Kill/destroy/ prevent growth of/ prevent spread of} <u>bacteria</u> (1) Reject antibiotics fight bacteria	2			2		
	(c)			{No/ lower risk of} rejection/ no wait for a donor/ more likely to be accepted		1		1		
	(d)	(i)		<u>Genome</u>	1			1		
		(ii)		Any **two** (×1) from: • Internet/ social media/ online/ TV/ email (1) • Publications/ journals/ papers/ books/ article (1) • talks/ lecture/ meetings/ conferences (1)		2		2		
				Question 5 total	**5**	**3**	**0**	**8**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content:** 1. Ref to transect 2. Correct ref use of tape 3. between X and Y/ measure 50m 4. place quadrat 5. and at regular intervals/every …metres (at least two positions in total) 6. count the {number/ amount} (of plants) (Accept present/absent) 7. for each {species/ A and B/ type of plant} 8. record results/ make a table/ write results (in the notebook) 9. bar chart/graph Ref to random placement of quadrats negates IC 4 and 5 **5-6 marks** At least seven points from the 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** At least four points from the 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.*	3	3	0	6		6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks At least one point from the indicative content *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with 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.*						
				Question 6 total	**3**	**3**	**0**	**6**	**0**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7/1	(a)			Sweat duct (1) Blood vessel (1) Correctly labelled with no ambiguity with regard to the placing of the arrows	2			2		
	(b)	(i)		39.5		1		1	1	
		(ii)	I	All 5 plots correct = 2 marks 4 plots correct = 1 mark 0/1/2/3 plots correct = 0 marks <1 small square tolerance		2		3	2	2
			II	Line drawn with a ruler passing through all the plotted points <1 small square tolerance (1)		1				
			III	Accept any figure within range 36.75 -36.85		1		1	1	
			IV	As skin temperature increases body temperature increases/ As skin temperature decreases body temperature decreases/ as body temperature increases skin temperature increases/ as body temperature decreases skin temperature decreases / as one increases so does the other/ ORA Positive correlation Reject reference to air temperature Reference to rate is neutral			1	1		
	(c)	(i)		Box number 3	1			1		
		(ii)		Box number 2	1			1		
				Question 7/1 total	**4**	**5**	**1**	**10**	**4**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/2	(a)			The use of a {organism/ predator/ species} to {destroy/ kill/ reduce numbers of} a {pest / invasive species/ alien species/ or description of}	1			1		
	(b)	(i)		*pretiosum* (1) because it {destroys/ attacks/ kills} the <u>eggs</u> so no <u>caterpillars</u> (to eat the plants) (1)			2	2		
		(ii)		Any **one** (×1) from: • (Test to check that) only the target species is harmed (1) • no other species are {harmed/ destroyed/ affected} (1) • That it doesn't become a pest itself/ does not become invasive (1) • (Does not) carry disease (1) • {Wasp/ it} would {survive/ adapt/ live} in {Peru/ the environment} (1)	1			1		
		(iii)		(Table does not show/ we do not know) : the area of land where crops are grown/ the amount of crops grown in each country/ the percentage of damage to crops (1)		1		1		
				Question 8/2 total	**2**	**1**	**2**	**5**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			To prevent contamination with another person's {DNA/ genes/ cells}/ So their DNA doesn't get profiled (1)		1		1		
	(b)			{Fragmentation/ to break/ cut} (the DNA/it) (into short lengths) (1)	1			1		
	(c)	(i)		(Male) 2			1	1		
		(ii)		**Male 2** **Band 1, 4, 5 & 7**  Any 3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 marks **If they circle 4 and all correct (2)** **If they circle 4 and one is incorrect (1)**			2	2		2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			Any **two** (×1) from: • To identify {disease / genetic disease/ medical conditions} (1) • Ref to crime – placing suspects at the scene of a crime /identifying criminals. (Not catching criminals unless qualified) (1) • Identifying dead bodies (1) • classification/taxonomy/identifying (evolutionary) relationships in animals or plants (1)	2			2		
				Question 3 total	**3**	**1**	**3**	**7**	**0**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		<table><tr><td></td><td>B</td><td>b</td></tr><tr><td>B</td><td>BB</td><td>Bb</td></tr><tr><td>b</td><td>Bb</td><td>bb</td></tr></table> Gametes correct (1) Cross correct (1) Gametes incorrect – award 1 mark if mechanics correct Incorrect letters used – award 1 mark if mechanics correct (unless two different letters are used e.g. N and W)		2		2		
		(ii)		Circle around **bb**		1		1		
		(iii)		The Punnett square shows the {probability/ chance/ possibility} of {the different genotypes / each outcome}/ shows the possible genotypes (1) not {the number of/ the amount of/ how many} offspring (1)		2		2	1	
	(b)			Any **one** (×1) from: (Scientific names/ they) are {universal/ same all over the World (1) Common names are {different all over the World/different in different languages} / avoids duplication with {local/ common} names (1) Avoids confusion with the use of common names (1)	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			• Polar bears live {in the Arctic (Circle)/in very cold climates/in colder climates} /ORA/ Polar bears live at -8 °C and black bears live 12°C (1) Any **one** (×1) from: • The {larger the mass/ smaller sa:vol ratio} {the less heat is lost / more heat is conserved/ the less heat the body loses} (1) • Polar bear may have {a higher proportion of/ thicker layer of/ more} {fat/blubber} (1) ORA for NA black bear (ignore any ref. to hibernation/ fur)		1	1	2		
				Question 4 total	**1**	**6**	**1**	**8**	**1**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5				**Indicative content:** • Check traps (on first day). (Check traps every day = 2 points of indicative content) • mark any voles caught / clipping hair with scissors • {record/ count} number of voles in the 1st sample • release {them/the voles} • examine traps on the second day • {record/ count} the number of voles in the 2nd sample • {record/ count} number of voles in the 2nd sample {(previously) marked/with clipped hair} • release the voles • (use data collected to) complete the {equation/calculation} use of equation (in order to estimate the population size.) **5-6 marks** At least seven points from the 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** At least four points from the 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.*	6			6		6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks At least one point from the indicative content *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with 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.*						
				Question 5 total	**6**	**0**	**0**	**6**	**0**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			(Cells divide by) mitosis (1) producing {genetically identical cells/ clones} (1)	2			2		
	(b)			Any **one** (×1) from: not harmful to {other insects/non target species/ humans} (1) only {kills/ harms/ effects/ control} {corn borer/ pest/ insects it targets/ certain insects} (1)	1			1		
	(c)	(i)		As use of Bt corn increases use of insecticide decreases (1) (More) Bt corn grown {killing (more) insects/ which is resistant to pests} (1) therefore less insecticide is used (1) (Award linked to 2nd MP) Reject As use of Bt corn decreases use of insecticide increases.			2	2		
		(ii)		{Pests/ European corn borer/ insects} is {no longer affected by/has developed resistance to} {Bt/ poison} Reject immunity		1		1		
	(d)			Gene {escapes/ passes/ transfers/ goes/ spreads} from {the plant/ Bt corn} (1) {enters/ into/ to} {other plants/native plants/wild corn} (1)			2	2		
				Question 6 total	**3**	**1**	**4**	**8**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			Chemical messengers (1) which control body functions (1) Ignore explanation of the role of a named hormone	2			2		
	(b)	(i)		{Normal/ range of/ optimum} (blood) glucose level (1)		1		1		
		(ii)	I	As (blood) glucose rises the level of insulin rises/ As (blood) glucose falls the level of insulin falls (1)		1		1	1	
			II	negative feedback (1)	1			1		
		(iii)		Glucose level is {low/dropping} (1) Glucagon {produced/ released} in pancreas (1) which converts glycogen to glucose (1)		2	1	3		
		(iv)		1 hour (1)		1		1		
		(v)	I	Line must continue to rise but not fall below 150. It can touch the top boundary of the graph but it mustn't pass through it. (1) ½ hour tolerance		1		1		
			II	Line on horizontal axis (1) line can extend from 0 to 4 ½ hours		1		1		
				Question 7 total	**3**	**7**	**1**	**11**	**1**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			TRUE FALSE TRUE All correct = 2 marks 2 correct = 1 mark 1 or 0 correct = 0 marks	2			2		
	(b)			*Case for:* A. Introductions of vaccine for diphtheria led to {eradication of/there being no/ decrease in} diphtheria (1) *Case against:* Any **two** (×1) from: B. Deaths from {polio/smallpox/ diphtheria} were decreasing before the introduction of the vaccines / deaths in graphs {8.1/ 8.2/ 8.3} were decreasing before the introduction of the vaccines (1) C. Cases of polio were caused by the vaccine (1) D. {Typhoid (fever) was eradicated/there was no typhoid (fever) / typhoid (fever) decreased} without the introduction of a vaccine. (1) E. Mandatory vaccination against smallpox led to an increase in deaths (1) F. (Mandatory) vaccination repealed led to a decrease in deaths (1)		3		3		
				Question 8 total	**2**	**3**	**0**	**5**	**0**	**0**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	3	0	6	1	0
2	0	5	4	9	4	8
3	3	0	5	8	0	5
4	4	4	0	8	1	0
5	5	3	0	8	0	0
6	3	3	0	6	0	6
6	4	5	1	10	4	2
7	2	1	2	5	0	0
Paper TOTAL	**24**	**24**	**12**	**60**	**10**	**21**

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	4	5	1	10	4	2
2	2	1	2	5	0	0
3	3	1	3	7	0	2
4	1	6	1	8	1	0
5	6	0	0	6	0	6
6	3	1	4	8	0	0
7	3	7	1	11	1	0
8	2	3	0	5	0	0
Paper TOTAL	**24**	**24**	**12**	**60**	**6**	**10**