



GCSE MARKING SCHEME

SUMMER 2024

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

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

**DOUBLE AWARD SCIENCE
UNIT 4 BIOLOGY 2**

SUMMER 2024 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

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Plant <i>Quercus</i> (must be capital Q)		2		2		
	(b)			<u>Scientific names are the same all over the world.</u> Scientific names are different all over the world. Common names are the same all over the world. <u>Common names are different all over the world.</u>	1			1		
	(c)			Any one (x1) from Light (1) (named) {minerals/ nutrients} (1) Water (1) Space (1) carbon dioxide (1) oxygen (1) Reject sun/ rain	1			1		
				Total mark for question 1	2	2	0	4	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			<div> <div>Large Paws</div> <div>White colour</div> <div>Thick layer of fat</div> <div>Sharp teeth</div> </div> <div> <div>To kill prey</div> <div>Spread weight over large area</div> <div>Camouflage</div> <div>Insulation to reduce heat loss</div> </div> <p>4 correct for 3 marks 3 correct for 2 marks 2 correct for 1 mark</p>		3		3		
	(b)			Has backbone/spinal column Ignore spine	1			1		
				Total mark for question 2	1	3	0	4	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	I	2	1			1		
			II	4	1			1		
		(ii)		<p>Both types of cell division can cause cancer. False</p> <p>Cancer is more likely to occur the older you are. True</p> <p>The number of chromosomes per cell is the same after mitosis and meiosis. False</p> <p>Both types of cell division occur all over the body. False</p> <p>4 correct for 3 marks 3 correct for 2 marks 2 correct for 1 mark</p>	1	2		3		
				Total mark for question 3	3	2	0	5	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			The older (the teacher) {the longer the time taken to react/ reaction time increases/ reaction speed decreases}/ the older (the teacher) the slower they react/ ORA			1	1		1
	(b)			Any two (x1) from Sex of <u>teachers</u> (1) Reference to caffeine/ drugs (1) Reference to environment (1) Time of day (1) Reject age			2	2		2
	(c)			Any one (x1) from Repeat (1) larger sample size (1) more people (1) compare to other groups (1) increase range of ages tested (1) Reject any reference to accuracy			1	1		1
	(d)	(i)		Light Accept X	1			1		
		(ii)		Electrical {impulse/ signals} (1) Reject: electronic	1			1		
		(iii)		Brain (1) Spinal cord (1) NOT spine/ spinal column	2			2		
				Total mark for question 4	4	0	4	8	0	3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			C A G C and G correct = 1 mark A = 1 mark	2			2		
	(b)			Double helix	1			1		
	(c)	(i)		C (1) Same {banding pattern/ bands/ pattern/ DNA profile/ genetic profile} (as crime scene)/ {DNA/ lines} match (up) (1)			2	2		
		(ii)		Any one (x1) from Paternity cases / identifying relatives(1) Evolutionary relationships (1) Classification (1) Genetic screening / Identifying genetic disease (1) Victim identification (1)	1			1		
				Total mark for question 5	4	0	2	6	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Axis: {Percentage/%} (of) Welsh population being treated (for) diabetes (1)	1			1	1	1
		(ii)		Plots = all correct = 2marks 1 error = 1 mark Tolerance of less than one small square		2		2	2	2
		(iii)		Line joining the plots (1) Tolerance of less than one small square		1		1	1	1
	(b)	(i)		As time increases {there are more people being treated for diabetes/ the percentage of people being treated for diabetes increased}		1		1		1
		(ii)		6.3 (1) Correct extrapolation on graph (1) Tolerance of less than one small square If not 6.3 - check graph award 1 mark for correct reading from their graph (1) award 1 mark if trend correct for their graph (1)			2	2	1	2
		(iii)		Not diagnosed yet/ do not know they have diabetes			1	1		
	(c)			Insulin	1			1		
	(d)	(i)		Benedicts (1) Heat/boil (1)	2			2		2
		(ii)		Green/ yellow/ orange/ (brick) red		1		1		1
Total mark for question 6					4	5	3	12	5	9

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7				<p>Indicative content:</p> <p>A. blood vessel wider/ vasodilation</p> <p>B. (hair erector) muscle relaxes/ gets longer</p> <p>C. hair lies flat</p> <p>D. (more) sweat</p> <p>E. more blood travels to {surface/skin}</p> <p>F. more heat loss</p> <p>G. {Sweat/ water} evaporates/ or description of</p> <p>H. Sweat on the {skin/ surface}/ coming out of a (sweat) pore}</p> <p>I. takes heat away</p> <p>5-6 marks At least 7 points from indicative content <i>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.</i></p> <p>3-4 marks At least 4 points from indicative content <i>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.</i></p> <p>1-2 marks At least 1 point from indicative content <i>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.</i></p> <p>0 marks: <i>No attempt made or no response worthy of credit.</i></p>		6		6		
				Total mark for question 7	0	6	0	6	0	0

Question				Marking details	Marks available														
					AO1	AO2	AO3	Total	Maths	Prac									
8/1	(a)			The {features/characteristics/traits} (of an organism) which result from the {genes/alleles/genotype/DNA}	1			1											
	(b)	(i)		man – Tt both required for 1 mark woman – tt	1			1											
		(ii)		Gametes correct (1) Must match (b)(i) Offspring genotypes correct (1) (If male alleles along top row and female alleles in left-hand column allow full marks) <table border="1"><tr><td></td><td>t</td><td>t</td></tr><tr><td>T</td><td>Tt</td><td>Tt</td></tr><tr><td>t</td><td>tt</td><td>tt</td></tr></table> If gametes incorrect can still get 1 mark if the mechanics of the cross is correct ie ECF If incorrect letters (ie not T and t) used 0 marks for gametes but 1 ECF mark for mechanics. If X, Y used 0 marks for Punnett square		t	t	T	Tt	Tt	t	tt	tt		1 1		2		
	t	t																	
T	Tt	Tt																	
t	tt	tt																	
		(iii)		0 : 1 : 1 Allow ECF from Punnett square		1		1	1										
	(c)			7 pairs of identical twins where one twin can and the other cannot. To gain the mark answer must refer to 7 eg 7 out of 33 identical twins/ last set of twins (in the table)			1	1		1									
				Question8/ 1 total	2	3	1	6	1	1									

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/2	(a)	(i)		1 329 = 3 marks Allow two marks for: 1328.5714285 (not whole number) 1328.571429 (not whole number) 1328.571428 (not whole number) 1328.57142 (not whole number) 1328.5714 (not whole number) 1328.571 (not whole number) 1328.57 (not whole number) 1328.5(not whole number) 1328.6 (not whole number) 1328 (incorrect rounding) Allow one mark for $\frac{10000000 - 700000}{700000} \times 100$ $\frac{9300000}{700000} \times 100$		3		3	3	
		(ii)		{overuse/over prescription} of <u>antibiotics</u> / patients not completing <u>antibiotic</u> courses Do not accept misuse of antibiotics	1			1		
	(b)	(i)		B			1	1		1
		(ii)		Any one (x1) from None of the bacteria have been {cleared/killed/destroyed} (1) all bacteria remain (1) {B/ they} are unaffected by {methicillin/ antibiotic} (1)			1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		Any one (x1) from Fungus (1) Mould (1) <i>Penicillium /Penicillium notatum / P. notatum</i> (1) (accept lower case p)	1			1		
		(ii)		Any one (x1) from checking {for side effects/ if it is safe} (1) large scale testing (1) {rigorous/thorough} testing (1) testing on animals (1) testing takes a long time to obtain results (1) Reference to testing needs to be qualified	1			1		
		(iii)		Any one (x1) from To find (new) {medicines / antibiotics / drugs/ cures} (1) So we don't lose species which could produce new medicines (1) Do not accept - biodiversity could produce new medicines or plants can produce medicines	1			1		
				Question 9/ 2 total	4	3	2	9	3	2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Any one (x1) from There are: 46 (chromosomes) (1) 23 pairs (of chromosomes) (1)		1		1		
		(ii)		Because other organisms (may) have {46/23 pairs / the same number } (of chromosomes)		1		1		
		(iii)	I	Circle around bottom right pair of chromosomes		1		1		
			II	Male		1		1		
		(iv)		would have {23 <u>chromosomes</u> /half the number of <u>chromosomes</u> /only have one of each <u>chromosome</u> }/ haploid number of <u>chromosomes</u> Answer must refer to number. Reject chromosomes would be divided in half		1		1		
	(b)			Cancer Reject named cancer or tumour	1			1		
	(c)	(i)		It can {differentiate/develop/turn} into {different types of cell/ specialised cells/ multiple tissues/ cells named in Image 3.2}		1		1		
		(ii)		Any three (x1) from <ul style="list-style-type: none"> too much glucose removed from blood (1) glucose in blood falls too low (1) glucose turned to glycogen (1) which is stored in liver (1) 	3			3		
				Question 3 total	4	6	0	10	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			<ul style="list-style-type: none"> • <u>they can reduce the need for chemical pesticides</u> (1) • they cause damage to plants • pests develop resistance to biological control agents • <u>they are specific to certain pests</u> (1) • they cannot be used on human food plants where chemical pesticides are banned <p>Each row correctly underlined 1 mark each If 3 underlines Max 1 mark If > 3 underlined 0 marks</p>	1	1		2		
	(b)	(i)		{Kill/ destroy} the <u>pests</u> (1) increase yield (1)		1	1	2		
		(ii)		<p>Any one (x1) (To check that) It does not affect {non-target/ other} species (1) there are no {harmful/ side} effects on humans/ crops are safe for (humans) consumption (1) Does not cause disease (1) Check that it can survive in UK climate (1) Does not become {invasive/ pest itself} (1)</p>		1		1		
				Question 4 total	1	3	1	5		

Question				Marking details	Marks available																						
					AO1	AO2	AO3	Total	Maths	Prac																	
5	(a)	(i)		sensory neurone (1) label line must touch structure (accept arrow on dendrites of sensory neuron)	1			1																			
		(ii)		effector (1) label line must touch structure (Must not land on motor neuron dendrites)	1			1																			
	(b)			Any two (x1) from automatic/without thought/involuntary (1) protective (1) fast (1) Reject stops you getting hurt	2			2																			
	(c)	(i)		<table border="1"><thead><tr><th colspan="2">Pair E</th></tr><tr><th>Distance (cm)</th><th>Time (s)</th></tr></thead><tbody><tr><td>21</td><td>0.21</td></tr><tr><td>17</td><td>0.19</td></tr><tr><td>15</td><td>0.18</td></tr><tr><td>11</td><td>0.15</td></tr><tr><td>8</td><td>0.13</td></tr><tr><td>14/ 14.4</td><td>0.17/ 0.172</td></tr></tbody></table> distance reading correct (1) time reading correct (1) Both means correct (1) Allow ECF	Pair E		Distance (cm)	Time (s)	21	0.21	17	0.19	15	0.18	11	0.15	8	0.13	14/ 14.4	0.17/ 0.172				3	3	3	3
Pair E																											
Distance (cm)	Time (s)																										
21	0.21																										
17	0.19																										
15	0.18																										
11	0.15																										
8	0.13																										
14/ 14.4	0.17/ 0.172																										

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)	I	27 cm			1	1	1	1
			II	Any one (x1) from Distraction (1) Incorrect {reading/ measurement} from ruler (1) Tiredness/ not {paying attention/ concentrating/ focused on task} (1) catcher not ready (1) Ignore they might not have started at zero/ human error			1	1		
		(iii)		Pair A			1	1	1	1
		(iv)		(The more repeats the) {faster} the reaction time/ time to react decreases/ (Speed of reactions) increases Reject results are faster			1	1	1	1
	(d)			Any two (x1) from <ul style="list-style-type: none"> Volume of {coffee/caffeine} consumed (1) Strength coffee consumed/coffee from the same container (1) No other {caffeine containing drinks/ stimulants} to be consumed before experiment (1) Drinks to be consumed at same time/ control when the {caffeine/ coffee} is drunk (1) Expt to start at the same time after consuming drink (1) 			2	2		2
				Question 5 total	4	3	6	13	6	8

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			The differences between members of the same <u>species</u> / differences within a <u>species</u> Intraspecific differences (1) caused by: - genetic causes/genes/alleles/ mutation (1) - environmental causes/ environment (1)	1 1 1			3		
	(b)	(i)		Continuous (variation)		1		1		
		(ii)	I	Any one (x1) from The giraffes in {the north (erly regions)/nearest to the Sahara desert} would {die out/ move southwards /migrate southwards} (1) {No/ fewer} giraffes in the north (ern regions) (1) More giraffes in the south (1)		1		1		
			II	<ul style="list-style-type: none"> Histogram would move to the right / there would be fewer height ranges (on left)/ there would be more giraffes in the height ranges on the right/ there would be fewer giraffes in the height ranges on left (1) Any three (x1) from <ul style="list-style-type: none"> {Height/ neck length} is determined by genes (1) Taller giraffes would {survive/ be selected for/ have an advantage} (1) as {they can reach more of the tree/ have more food} (1) breeding /reproduce/ produce offspring (1) Passing on their genes (for height) to their offspring (1) (Reverse argument acceptable for shorter necked giraffes) 		1 1 1	1	4		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		Any one (x1) from {universal/worldwide} (1) same all over the world (1) avoids confusion(1) same in all languages (1) (any) different common names results in confusion(1)	1			1		
		(ii)		Any one (x1) from Should show <u>species</u> of giraffe/ OWTTE (1) Do not know which <u>species</u> of giraffe are included in the histogram (1) Graph may have unequal numbers of the 4 <u>species</u> of giraffe (1) Different <u>species</u> of giraffe may only be found in certain height ranges (1) Do not know which species have longer or shorter necks (1)			1	1		
				Question 6 total	4	5	2	11		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7				<p>Indicative content:</p> <p>Structure of DNA</p> <p>A. two chains/strands</p> <p>B. of sugar and phosphate</p> <p>C. {connected/ joined} by bases/ joined by hydrogen bonds</p> <p>D. form a double helix</p> <p>Bases</p> <p>E. names of 4 bases – adenine, thymine, cytosine, guanine (correct or phonetic spelling)</p> <p>F. (complementary) base pairing A – T & C – G (can use letters here)</p> <p>Triplet code</p> <p>G. 3 bases form the {triplet code/ codon} or example of three bases</p> <p>H. which codes for an amino acid</p> <p>I. amino acids form proteins</p> <p>5-6 marks</p> <p>At least seven points from the indicative content</p> <p><i>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.</i></p> <p>3-4 marks</p> <p>At least four points from the indicative content</p> <p><i>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.</i></p>	6			6		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks At least one point from the indicative content <i>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.</i> 0 marks No attempt made or no response worthy of credit.						
				Question 7 total	6			6		

*Foundation***SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	2	0	4	0	0
2	1	3	0	4	0	0
3	3	2	0	5	0	0
4	4	0	4	8	0	3
5	4	0	2	6	0	0
6	4	5	3	12	5	8
7	0	6	0	6	0	0
8	2	4	0	6	1	1
9	4	2	3	9	2	3
Total	24	24	12	60	8	15

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	4	0	6	1	1
2	4	2	3	9	2	3
3	3	7	0	10	0	0
4	1	3	1	5	0	0
5	4	3	6	13	6	8
6	4	5	2	11	0	0
7	6	0	0	6	0	0
TOTAL	24	24	12	60	9	12