



GCSE MARKING SCHEME

SUMMER 2022

**GCSE
BIOLOGY – UNIT 1
3400U10-1 AND 3400UA0-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2022 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 GCSE BIOLOGY
SUMMER 2022 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.

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)		Algae		1		1		
		(ii)		penguin		1		1		
	(b)			Transfer of energy /is eaten by	1			1		
	(c)	(i)		Decrease			1	1		
		(ii)		Increase			1	1		
				Question 1 total	1	2	2	5	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			B C A D 3/4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark 0 correct = 0 marks	3			3		
	(b)			Specialised (1) Cells (1) Organ (1)	3			3		
				Question 2 total	6	0	0	6	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			<p>Part of blood</p> <p>plasma white blood cells red blood cells platelets</p> <p>Function</p> <p>carry oxygen defend against disease clot blood carries carbon dioxide and dissolved food</p> <p>3/ 4 correct = 2 1/2 correct = 1</p>	2			2		
	(b)	(i)		13 mm Accept range 13 -14 mm		1		1	1	1
		(ii)		<p>0.013 = 2 marks</p> <p>$\frac{13}{1000} = 1$ mark</p> <p>Ecf</p> <p>Correct answer of bi /1000 = 2 marks</p> <p>bi/1000 (incorrect answer) = 1 mark</p>		2		2	2	2
		(iii)		<p>White (blood cell) / named white blood cell (1)</p> <p>Has a nucleus/ is larger (than a red blood cell) (1)</p>		2		2		
				Question 3 total	2	5	0	7	3	3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Five plots correct (2) three/ four plots correct (1) 0/1/2 correct (0) Tolerance $\pm$ 1 small square Plots joined with a ruler (1)		3		3	3	
		(ii)		Any one (×1) from: In context of Blodwen {results/ lactic acid/ concentration/ levels} is higher/ {results/ lactic acid/ concentration/ levels } increased faster/ {results/ lactic acid/ concentration/ levels } decreased faster/ had the biggest change in {results/ lactic acid/ concentration/ levels} had a higher peak/ reference to data Accept reverse answer for Cerys Accept correct ref to candidate graph		1		1		
	(b)	(i)		270		1		1	1	
		(ii)		Accept range 25-35		1		1	1	
	(c)			glucose (1) → lactic acid (1)	2			2		
	(d)			Oxygen debt (built up) (1) Oxygen required to {break down/ owtte} lactic acid (1)		2		2		
				Question 4 total	2	8	0	10	5	0

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			True False False False False 5 correct = 4 marks 4 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark 1 correct = 0 marks	1	1	2	4		
	(b)	(i)		C			1	1		
		(ii)		Accept range 16 – 25 (must be whole number)		1		1	1	1
		(iii)		IV = distance (1) DV = number of species (of lichen) (1)		2		2		2
		(iv)	I	{As distance increases/ the further away}, {number/ species/ it/ lichen} increases / ORA		1		1		1
			II	Less polluted as you go further from city/ more polluted in the city (1) Must be comparative (More) lichen can survive in lower polluted areas (1) ORA			2	2		
		(v)		Repeat the experiment/ test in a different city eg London owtte/ ref to reproducibility/owtte			1	1		1
				Question 5 total	1	5	6	12	1	5

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			More {cigarettes smoked/ you smoke a day}, higher risk of lung <u>cancer</u> (1) Longer smoking, higher the risk of lung <u>cancer</u> (1) ORA for both mp			2	2		2
	(b)			Nicotine (1) + addictive (1) Tar (1) + {clogs airways/causes lung cancer/ paralyses cilia} (1) Carbon monoxide (1) + less oxygen carried by {RBCs/ blood}(1)	2			2		
	(c)	(i)	I	Mucus – {traps/owtte} {dirt / dust/ bacteria/ microbes}	1			1		
			II	Cilia – {move/ owtte} mucus (towards the throat)	1			1		
		(ii)		cilia {paralysed/ owtte} (1) {dries/ thickens/ more} mucus (1)	2			2		
		(iii)		Emphysema/ bronchitis/ named cancer / cardiovascular/ COPD Reject lung cancer	1			1		
				Question 6 total	7	0	2	9	0	2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			<p>Indicative content:</p> <ul style="list-style-type: none"> • Starch test = iodine • Glucose test = benedicts + heat (strongly) • Glucose was {present / positive test / description of colour change} (after 30 minutes) • Starch was {absent/ negative/ brown colour} (after 30 minutes) • starch is broken down into glucose • by amylase • starch (molecules) too big to pass (across Visking tubing) • glucose (molecules) small enough to pass (across) • by diffusion/ or description of <p>5-6 marks At least seven points from the 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 four points from the 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>	2	2	2	6		3

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 <i>No attempt made or no response worthy of credit.</i>						
	(b)	(i)		Made = F (1) Accept liver Stored = E (1) Accept gall bladder		2		2		
		(ii)		Bile {emulsifies fats/breaks large droplets into smaller ones/ owtte} (1) Increases surface area (for lipase/ enzyme to act on) (1) OR Neutralises (stomach) acid (1) To provide the correct pH for lipase (1)	2			2		
		(iii)		Small intestine/ C	1			1		2
				Question 7 total	5	4	2	11	0	5

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/ 1	(a)	(i)		Oxygen (1) Accept O ₂	1			1		
		(ii)		Any two (×1) from: <ul style="list-style-type: none"> • respiration/ respire/ for energy (1) • {converted to /stored as} starch (1) • cellulose (1) • proteins (1) • oils (1) • sucrose (1) 	2			2		
	(b)	(i)		5 =2 marks 4.6/4.7/4.66666667 = 1 mark		2		2	2	2
		(ii)		As {temperature/ it} increases the number of bubbles increase then decrease (1) Ref. to 30°C/optimum (temperature) (1) Accept 27 (mean number of bubbles)		2		2		2
		(iii)		<ul style="list-style-type: none"> • (photosynthesis is controlled by) enzymes (1) • (the enzymes have been) denatured/ shape of active site has changed/ active site has denatured (1) 			2	2		2
				Total for question 8/1	3	4	2	9	2	6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/2	(a)	(i)		A = muscle (layer) (1) B = endothelium (1)	2			2		
		(ii)		(Lumen would be) {narrower/ smaller}/ smaller diameter/ it decreases (1) Presence of {atheroma / plaques/ fatty deposits}/ Build-up of {fat/ cholesterol} <u>on wall</u> (1)			2	2		
	(b)	(i)		Artery has a {narrower/ smaller} <u>lumen</u> (1) Thicker <u>wall</u> / ORA (1) Accept use of data		2		2		
		(ii)		Valves (1) Ensure a one-way flow (of blood) / allow blood to return to the heart under low pressure/ prevent backflow (of blood) (1)	1	1		2		
	(c)	(i)		Any one (×1) from Glucose/ named nutrient (1) Oxygen (1) Water (1) Hormones (1)	1			1		
		(ii)		Thin walls/ one cell thick (1) Reference to <u>diffusion</u> (1) OR {Extensive/ large} network (1) Each cell {is near to a capillary/ has a good blood supply} (1)	1	1		2		
				Total for question 9/2	5	4	2	11	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Stomach labelled P		1		1		
		(ii)		Small intestine labelled B		1		1		
		(iii)		Breakdown of {large/ insoluble} molecules into {small/ soluble} molecules (1) For absorption / or description of (1)	2			2		
	(b)	(i)		Enzyme-substrate complex (1)	1			1		
		(ii)		Glucose (1) Energy/ respiration /stored as glycogen (1)	2			2		
		(iii)		Change shape / denature (1) Explanation: any one (×1) from <ul style="list-style-type: none"> low pH (in stomach) (1) (stomach) {has a pH of 2-3/ high acidity} (1) 		2		2		
				Total for question 3	5	4	0	9	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		To kill the {microorganisms/ bacteria/ fungi} (on the surface of the peas)	1			1		1
		(ii)		<u>Peas</u> have respired (1) Heat (energy) released (1)		2		2		2
	(b)			It shows that the temperature rise (in flask A) was due to heat released by the peas in <u>respiration</u> / to show that dead peas (in flask B) would not <u>respire</u>			1	1		1
	(c)			Lower + {anaerobic respiration is less efficient/ glucose is not completely broken down/ less energy released per glucose molecule/ not all the glucose was broken down/ ORA}		1		1		
				Total for question 4	1	3	1	5	0	4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Correct linear scale (1) Correct labelling x-axis = concentration of solution mol/dm ³ (1) All plots correct = 2 marks 3/4 correct plots = 1 mark 0/1/2 correct plots = 0 marks Tolerance $\pm < 1$ small square Accurate joining of points / line of best fit (1)	2	2 1		5	5	5
	(b)	(i)		Concentration of water higher outside/ORA (1) Water moves in (1) By osmosis (1) Through s.p.m. (1)	1	3		4		
		(ii)		Concentration from candidates graph; Accept 0.27-0.28 (1) Water lost from carrot cells is equal to water entering cells/No net movement of water (OWTTE) (1) No concentration gradient/Concentration inside and outside cells must be equal (1) Ecf			3	3		3
				Total for question 5	3	6	3	12	5	8

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Medium			1	1		
		(ii)		<u>Nitrates</u> (levels) {peak/ are high/ increase} around {January/ winter (months)/ start of the year}(each year) (1) <u>Nitrate</u> levels {decrease/ are low} {between April and October/ in summer/ in July/ middle of the year} (each year) (1)		2		2		
		(iii)		Nitrates used by {algae/ (aquatic) plants} (1) For {growth / protein} (1) OR In {summer/ named month} less rainfall (1) less leaching of nitrates/ less run off/ less eutrophication (1) OR (terrestrial) plants use more nitrate in summer (1) Therefore less fertiliser run off/ owtte (1) 2 nd mark must be linked to first		2		2		
	(b)			Indicative content: <ul style="list-style-type: none"> • Ref. fertilisers containing nitrates/ NPK • washed into water/ run off/ leaching • (the algal bloom) blocks the sunlight from aquatic plants • plants die • decompose/ break down/ decay • by decomposers/microorganisms/ bacteria/ fungi/ microbes • which use oxygen • in (aerobic) respiration • {animals/ fish} {suffocate/ die} 	6			6		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				<p>5-6 marks At least seven points from the 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 four points from the 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 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></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
				Total for question 6	6	4	1	11	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			X = phosphate (1) Y = potassium (1) Z = nitrates (1)	3			3		3
	(b)	(i)		Prevent evaporation of water (from the cylinder)		1		1		1
		(ii)		Any two (x1) from Roots have {taken in/absorbed} water (1) Ref to xylem moving water through plant (1) Water {released/ leaves/ evaporates} from {stomata/ leaves} (1) Correct ref. transpiration (1)		2		2		2
		(iii)		Any two (x1) from less nutrients taken up in B / ORA (1) less {energy/ ATP}/ ORA (1) ref to active transport (1) Ref to B only required once in answer	1	1		2		2
				Total for question 7	4	4	0	8	0	8

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		3 marks = 17 000% If incorrect award 2 marks for 16566.666666667 (correct rounding) If incorrect award 1 mark for any of 16566/ 16566.6 (incorrect rounding) $\frac{1.5-0.009}{0.009} \times 100$ $\frac{1.491}{0.009} \times 100$		3		3	3	
		(ii)		Mercury {released into the air falls in rain/ enters water} (1) <u>Concentration</u> increases along food chain/ <u>bioaccumulation</u> (1) {Reaches toxic <u>level</u> / causes infertility/ nervous system damage/ kidney damage/ breathing difficulties/ it is lethal/ causes death} (in humans) (1)	1		2	3		
	(b)			Reduction in <u>CO₂</u> emissions reducing {global warming/ climate change/ greenhouse effect/ or description of} Reject stopping/ preventing Accept less sulfur dioxide resulting in less acid rain	1			1		
				Total for question 8	2	3	2	7	3	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	TOT	MATH	PRAC
9	(a)	(i)		Alveolus correctly labelled	1			1		
		(ii)		Any two (×1) from <ul style="list-style-type: none"> large surface area (1) thin <u>walls</u>/ one cell thick <u>wall</u> (1) moist (lining) (1) {rich/ close to/ good} blood supply (1) 	2			2		
	(b)	(i)		{Cilia unable to move / less ciliated cells/ less cilia} and {Mucus has to be coughed out/ because mucus is not being pushed out/ because mucus stays in lung}			1	1		
		(ii)		Diameter of <u>airways</u> reduced/ smaller <u>airways</u> / narrower <u>bronchiole</u> (1) Less {gas exchange/ air able to move in and out / exchange of oxygen and carbon dioxide} (1)			2	2		
	(c)			The study is not valid because (must be present to award any marks but not creditworthy alone) There has only been one study (on e-flavourings)/ study has not been repeated/ not reproduced (1) only a {small number of/ 51} flavours have been studied/ sample size is small/ only 39 out of 7700 flavours contain diacetyl (1)			2	2		
				Total for question 9	3	0	5	8	0	0

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	1	2	2	5	0	0
2	6	0	0	6	0	0
3	2	5	0	7	3	3
4	2	8	0	10	5	0
5	1	5	6	12	1	5
6	7	0	2	9	0	2
7	5	4	2	11	0	5
8	3	4	2	9	2	6
9	5	4	2	11	0	0
TOTAL	32	32	16	80	11	21

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	4	2	9	2	6
2	5	4	2	11	0	0
3	5	4	0	9	0	0
4	1	3	1	5	0	4
5	3	6	3	12	5	8
6	6	4	1	11	0	0
7	4	4	0	8	0	8
8	2	3	2	7	3	0
9	3	0	5	8	0	0
TOTAL	32	32	16	80	10	26