GCSE MARKING SCHEME

SUMMER 2024

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

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.

WJEC GCSE BIOLOGY

SUMMER 2024 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

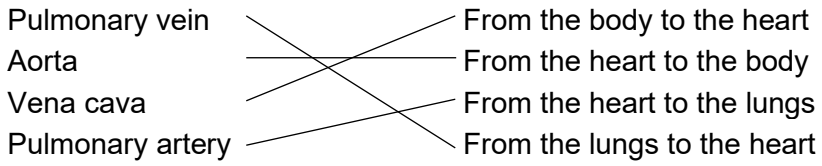
A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide 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

FOUNDATION TIER

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			**A** right atrium labelled (1) **B** left ventricle labelled (1)	2			2		
	(b)			 3/4 correct for 3 marks 2 correct for 2 marks 1 correct for 1 mark	3			3		
	(c)			Prevent the backflow of blood underlined	1			1		
	(d)			Muscle (1) Pump (1) Coronary (1)	3			3		
				Question 1 total	**9**	**0**	**0**	**9**	**0**	**0**

<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>2</td><td>(a)</td><td></td><td></td><td>X bronchiole
Y alveolus</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>I</td><td>Oxygen</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>II</td><td>Diffusion</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>III</td><td>Respiration</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>Any two (x1) from:
{Thin / one cell thick} alveolus walls (1)
{Thin / one cell thick} capillary walls (1)
Capillary very close to alveolus / good blood supply (1)
Large surface area (1)
Moist (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td></td><td><table><tr><th>Gas</th><th>Inspired air (%)</th><th>Expired air (%)</th></tr><tr><td>Nitrogen</td><td>78</td><td>78</td></tr><tr><td>Oxygen</td><td>21</td><td>16</td></tr><tr><td>Carbon dioxide</td><td>0.04</td><td>4</td></tr></table></td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 2 total</td><td>8</td><td>2</td><td>0</td><td>10</td><td>0</td><td>0</td></tr>
</table>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		12.3 (2) **Award 1 mark for** 49/4 12.25		2		2	2	
		(ii)		(Used for) energy	1			1		
	(b)	(i)		17 g		1		1	1	
		(ii)		**Any two (x1) from:** Obesity (1) Heart disease (1) Circulatory disease / CVD (1) Diabetes (1)	2			2		
	(c)	(i)		**Any two (x1) from:** (wear) eye protection / goggles / safety glasses (1) care with mounted needle (1) hold mounted needle at arm's length / keep hands away from flame (1) hair tied back (1) stand up (1) Allow apparatus to cool before moving (1)		2		2		2
		(ii)		Thermometer		1		1		1
	(d)	(i)		21 (^{o}C)		1		1	1	1
		(ii)		3528 = 2 marks **If incorrect award 1 mark for** $\underline{20 \times 21 \times 4.2}$ 0.5 Allow ecf		2		2	2	2
		(iii)		{Heat / energy} lost (to the surroundings) / the crisp was not all burnt			1	1		1
				Question 3 total	**3**	**9**	**1**	**13**	**6**	**6**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		False True True False All correct for 3 marks 3 correct for 2 marks 2 correct for 1 marks 0/1 correct = 0 marks		3		3		
		(ii)		{Mercury / it} is {released / dumped} into {water / sea / ocean} (by factory) (1) Algae took up the mercury (1)		1	1	2		
	(b)	(i)		12 = 2 marks 1200 / 100= 1 mark		2		2	2	
		(ii)		**Any two (x1) from:** • Mercury {accumulates in living tissue / cannot be broken down} / bioaccumulation (1) • Mercury (is taken up by algae in the sea) and then passed along the food chain / concentration of mercury increases along the food chain (1) • Until it reaches toxic levels / (cats get) lethal dose/ level becomes too concentrated (1)			2	2		
				Question 4 total	**0**	**6**	**3**	**9**	**2**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5				**Indicative content:** A. Carbon transferred from air to plants / carbon dioxide taken in by plants B. {by / for} photosynthesis / **W** is photosynthesis C. Carbon transferred from plants to animals. D. by feeding / **Y** is feeding. E. Carbon transferred from {animals / plants / decomposers} to the air / carbon dioxide is released by {animals / plants / decomposers} F. by respiration / **X** is respiration. G. Carbon {transferred into air / released} by combustion / **Z** is combustion. H. (The names of the decomposers are) bacteria. I. and fungi **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.*	2	4		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	**2**	**4**	**0**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			Proteins (1) Fats / lipids / oils (1)	2			2		
	(b)	(i)		• 40°C (1) • Because it removed the most stain / The stain was the {lightest / most faded / least visible} / Most egg removed / Fabric was the cleanest / owtte (1)			2	2		2
		(ii)		**Any three from (x1)** • Stain not removed (1) • Too hot / temperature too high / above optimum temperature (1) • {Enzymes / active site} are <u>denatured</u> (1) • Active site changes <u>shape</u> (1) • Substrate does not fit (1)			3	3		
	(c)	(i)		As temperature increased {the more stain was removed / less egg remained}		1		1		1
		(ii)		as a control / to compare results / owtte		1		1		1
		(iii)		can wash at lower temperatures / can wash at 40°C instead of 60 °C (1) save <u>energy</u> / ref energy sources e.g. less electricity (1)		1	1	2		
	(d)			**Any two (x1) from** {Area / size} of {egg / staining} (1) {Mass / concentration} of washing powder (1) volume of water in beaker (1) type of fabric (1) pH (1)			2	2		2
				Question 6 total	**2**	**3**	**8**	**13**	**0**	**6**

Question				Marking details	Marks					
					AO1	AO2	AO3	Total	Maths	Prac
7/1	(a)	(i)		grass	1			1		
		(ii)		Producer Secondary consumer Carnivore Herbivore Primary consumer **Both correct for 1 mark**		1		1		
		(iii)		grass ⟶ zebra ⟶ lion ⟶ fleas **1 mark** for organisms in correct order joined by arrows		1		1		
		(iv)		Sun / light / sunlight	1			1		
		(v)		**Any one (x 1) from:** (energy is) used in{growth / repair} (1) (energy is) lost in {waste materials / named waste materials / respiration / movement / heat} (1) not all of the organism is {consumed / digested} (1)	1			1		
		(vi)		**Any one (x 1) from:** because {pyramids of numbers / it} does not take into account the {size / mass} of the organisms (1) fleas are smaller than lions (1) there are more fleas than lions (1) lots of fleas can live on one lion (1) more tertiary than secondary consumers (1)			1	1		

Question				Marking details	Marks					
					AO1	AO2	AO3	Total	Maths	Prac
		(vii)		• pyramid shaped with 4 bars (each bar smaller than the one below). (1) • Labelled with the organisms names (1) 2nd MP linked to 1st MP		2		2		
				Total for question 7/1	**3**	**4**	**1**	**8**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8/2	(a)			Nitrates / N (1) Phosphates / P (1) Potassium / K (1)	3			3		
	(b)			IV – (addition of) fertiliser / treatment of tomato plants (1) DV – mass of tomatoes (1)	2			2		2
	(c)	(i)		46			1	1	1	
		(ii)		30 = 2 marks 29.6 = 1 mark		2		2	2	2
		(iii)		Adding fertiliser: increased the mass / made {the tomatoes / them} {bigger / grow more} Accept reverse argument for no fertiliser Ignore more tomatoes			1	1		1
	(d)	(i)		**Any one (x1) from:** {species / type} of tomato (plant) (1) volume of water (1) light (1) soil (1) temperature (1) time that the plants grew for / plants grew for 3 months (1)		1		1		1
		(ii)		Reason for inaccuracy • small sample size / only 10 / • his sample may not have been random/ there could have been larger tomatoes on the plants without fertiliser that he did not pick / owtte Suggestion for improvement • {measure / use} (the mass of) {all / more} of the tomatoes / increase sample size		1	1	2		2
				Question 8/2 total	**5**	**4**	**3**	**12**	**3**	**9**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Red blood cell / RBC correctly labelled White blood cell / WBC correctly labelled **Both correct for 1 mark** Ignore direction of arrow. Arrow must touch cells	1			1		
	(b)	(i)		**3 marks** 57 **2 marks for sight of** 57.0877944 / 57.33333333 (if rounded earlier) $\frac{2666}{4670}$ x100 $\frac{43}{75.3225806}$ x100 **1mark for sight of** 43 x 62 = 2 666 4670/62 = 75.3225806		3		3	3	
		(ii)		{Transport / carries} {CO_2 / soluble food / urea / hormones / antibodies / glucose / amino acids / vitamins / minerals / fats/ products of digestion} / distribution of heat (1) Ignore: carry {blood cells / nutrients}	1			1		

	(c)	(i)		**Any two (x1) from:** • least red blood cells / RBC below normal range / RBC lower than other patients / less RBC than other patients / use of data, e.g. RBC is 4.4 and the range is 4.5 - 5.2 (1) • Least haemoglobin / haemoglobin below normal range / haemoglobin lower than other patients / less haemoglobin than other patients / use of data, e.g. haemoglobin is 10.9 and the range is 13.2 - 14.8 (1) • cannot {carry / transport} enough oxygen / {red blood cells / haemoglobin} {carry / transport} oxygen (1)	1	1		2		
		(ii)		• {least / lowest concentration of / lowest number of} white blood cells / less white blood cells than the other patients (must be comparative) (1) • {defend / protects} against {disease / pathogens / bacteria / fungi / viruses / microbes / microorganisms} / {Kill / destroy / engulf} {bacteria / fungi / viruses / microbes / microorganisms / pathogens} / correct ref to antibody production(1) Ignore references to infection	1	1		2		
				Question 3 total	**4**	**5**	**0**	**9**	**3**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Indicator species (1)	1			1		
	(b)			Location A = high (1) Location B = low (1)			2	2		2
	(c)			• (Sun)light is blocked / less light reaches the plant (1) • (aquatic) plants die (1) Ignore algae • {decomposers / bacteria} {decompose / decay} (dead material) (1) • (decomposers) use oxygen for respiration (1)	4			4		
				Question 4 total	**5**	**0**	**2**	**7**	**0**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		A = guard (cell) (1) B = epidermal (cell) / epidermis (1)		2		2		
		(ii)		24mm(1) Accept 23 - 25mm	1			1		1
		(iii)		**For 24mm** Correct answer = 1200 (2) **If incorrect award 1 mark for sight of** **Correct conversion** 24mm to 24000µm / 20µm to 0.02mm (must show evidence of units) **Correct substitution into a formula** 24000/20 OR 24/0.02 **For 25mm** Correct answer = 1250 (2) **If incorrect award 1 mark for sight of** **Correct conversion** 25mm to 25000µm / 20µm to 0.02mm (must show evidence of units) **Correct substitution into a formula** 25000/20 OR 25/0.02		2		2	2	2

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				For 23mm Correct answer = 1150 (2) **If incorrect award 1 mark for sight of** **Correct conversion** 23mm to 23000µm / 20µm to 0.02mm (must show evidence of units) **Correct substitution into a formula** 23000/20 OR 23/0.02 Accept ecf from (a) (ii)						
	(b)	(i)		Stomata open {in response to / during} {light / day} / ORA(1) Ignore reference to stomatal size			1	1		
		(ii)		(stomata) {control / regulate / reduce} {water loss / transpiration} (1) Reject prevent water loss		1		1		
				Question 5 total	**1**	**5**	**1**	**7**	**2**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			**Aerobic** Water / H_2O / H2O / H^2O (1) Carbon dioxide / CO_2 / CO2 / CO^2 (1) **Anaerobic** Lactic acid / lactate (1)	3			3		
	(b)			**Any one (x1) from** • {lactic acid / lactate} causes {pain / (muscle) fatigue / cramps} (1) • Oxygen debt (1) • provides less {energy / ATP} / less efficient than aerobic respiration (1)	1			1		
	(c)	(i)		**Any one (x1) from** • takes time for respiration to {produce ATP / release energy} (1) • provide {energy / ATP} before respiration starts (1) • There is no {ATP / energy} from respiration at the start (of exercise) (1)			1	1		
		(ii)		Aerobic respiration produces {more / most} ATP / aerobic respiration produces 38 ATP compared to anaerobic which produces 2 ATP / owtte / ORA (1) Glucose (molecule) not fully broken down (in anaerobic respiration) / ORA (1)		1	1	2		
				Question 6 total	**4**	**1**	**2**	**7**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			• It is always higher in females (than males) / ORA (1) • Both increase (and level off) (1) • The difference between males and females has decreased / It has increased more for men (than women) (1) Ignore {women / men} live longer / references to life expectancy		3		3		
	(b)			**Any two (x1) from:** Excess energy stored as fat (1) Leading to obesity (1) (Which could lead to) heart disease / CVD / coronary heart disease / diabetes / any correct health related issue (1)	2			2		
	(c)	(i)		**Any two (x1) from:** • {more / increased} {fruit / vegetables} (1) • {more / increased} {fibre / vitamins / minerals} in diet (1) • Contribute to a balanced diet / Prevent constipation / reduce {risk of / chance of} {bowel cancer / heart disease / high blood pressure / stroke} (1) Accept ref to preventing dietary deficiencies		2		2		
		(ii)		**Any two (x1) from:** (less) (type 2) diabetes (1) (less) obesity (1) (less) tooth decay (1)	2			2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			Strong evidence because: Large number of researchers / 7 000 researchers (1) in {a large number of countries / 156 countries} (1) Max one mark if do not refer to strength of evidence / if judgement is incorrect			2	2		2
				Question 7 total	**4**	**5**	**2**	**11**	**0**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		Lock and key (1)	1			1		
		(ii)		{Sequence / order / chain} of amino acids (in protein) / folding of {amino acid chain / protein} (1)	1			1		
	(b)	(i)		• Less (intensity of) light passing through (beaker / solution) / light {has been blocked / cannot pass through} / harder for light to pass through (1) • Iodine has reacted with starch / solution in beaker has turned {blue / black / opaque / darker} (1)		1	1	2		1
		(ii)		92 = 3 marks **If incorrect award 2 marks** Correct readings from graph **and** substitution into formula (620-160)/5 or 460/5 **If incorrect award 1 mark** Correct readings from graph 620 **and** 160 460		3		3	3	
		(iii)		• carbohydrase (has been added / breaks down) (1) • (so) starch (is broken down) to glucose (1) Accept maltose • {More / easier for} light passing through (solution beaker) / solution becomes {lighter / less opaque} / solution turns from {blue / black} to {orange / brown} / {blue / black} colour {starts to clear / disappears} (1)		2	1	3		3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iv)		**Any two (x1) from:** • {volume / 100cm^3} of starch (1) • {volume / 20cm^3} of carbohydrase (1) • {number / amount} of drops of iodine / volume of iodine (1) • {concentration / (1)%} of starch (1) • {concentration / (10)%} of carbohydrase (1) • concentration of iodine (1) • temperature (1) • pH (1) • distance of lamp from sensor / light intensity of lamp (1)	2			2		2
		(v)		Line on graph remains at same level from 10 minutes (1)			1	1		
				Question 8 total	**4**	**6**	**3**	**13**	**3**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9				**Indicative content:** *Potato A* A. {level / volume} of solution (in cavity) increases B. Lower water concentration in the potato compared to the {Petri dish / distilled water} / ORA. C. (so) water moves into the potato (from the Petri dish / distilled water) D1 Lower water concentration in the {cavity / sugar solution} compared to the potato / ORA OR D2 lower water concentration in {cavity / sugar solution} compared to {distilled water / Petri dish} / ORA E. (So) water moves into the {cavity / sugar solution} F. Correct use of the word osmosis / water has moved down a water {concentration / potential} gradient / water moves from a high concentration of water to a low concentration of water G. Any correct reference to {semi / partially / selectively} permeable membrane. *Potato B* H. This is a control (experiment) Reject reference to controlled I. to show that it is the presence of sugar solution (in the cavity of the fresh potato) that causes the effect observed / to show that the effect is caused by the independent variable	2	2	2	6		6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				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.* **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 9 total	**2**	**2**	**2**	**6**		**6**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

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