GCSE MARKING SCHEME

SUMMER 2022

GCSE
BIOLOGY - UNIT 2
3400U40-1 AND 3400UD0-1 (CONTINGENCY)

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 - UNIT 2

SUMMER 2022 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.

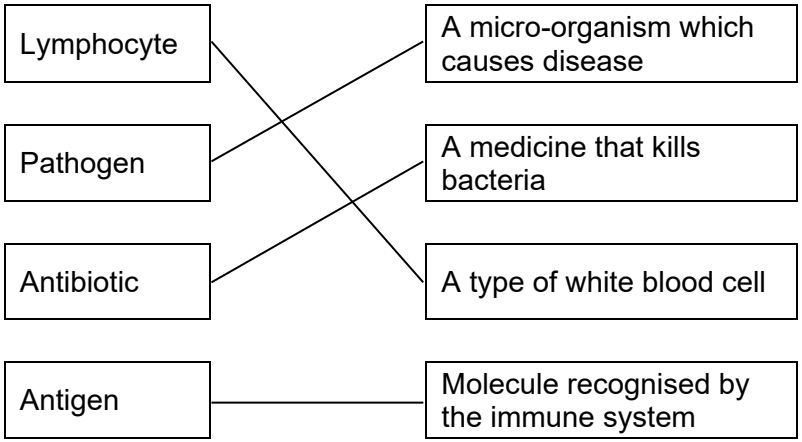
Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

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

FOUNDATION TIER

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		 4 correct = 2 marks 2/3 correct = 1 mark 0/1 correct = 0 marks	2			2		
	(b)			**Any two (×1) from:** • contact/ touch (1) • aerosol/ sneezing/ coughing/ inhaling (1) • body fluids/ named body fluid/{sexually transmitted/sexual intercourse} (1) • contaminated water/food (1) • insects/ named insect e.g. mosquito (1) • through the air (1) • sharing needles (1)	*2*			2		
	(c)	(i)		bacteria	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		antibiotics do not kill virus/ antibiotics only kill bacteria ignore fighting or attacking bacteria	1			1		
		(iii)		Bacteria are becoming immune to the antibiotics. Bacteria are becoming resistant to the antibiotics. Humans are becoming immune to the antibiotics. Humans are becoming resistant to the antibiotics.	1			1		
				Total mark for question 1	**7**	**0**	**0**	**7**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		5 accurate plots = 2 marks 4 accurate plots = 1 mark 3/2/1/0 plots = 0 marks <1 small square tolerance		2		2	2	
		(ii)		Join plots with a ruler reject line back to 0,0 or beyond point at 5m		1		1	1	
	(b)			As distance from wall increases the height of the plant increases/ the further away from the wall the taller the plant		1		1		1
	(c)			**Any two (×1) from:** Light (1) accept sunlight Water (1) Minerals (1)		2		2		2
	(d)			Repeat/ Use more plants (at each distance)			1	1		1
	(e)	(i)		CO_2 concentration			1	1		1
		(ii)		height of plants after 1 year			1	1		1
				Total mark for question 2	**0**	**6**	**3**	**9**	**3**	**6**

<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>3</td><td>(a)</td><td>(i)</td><td></td><td><table><tr><td>In 1899 there were no new malaria patients in the test area.</td><td>True</td></tr><tr><td>Insecticides kill Plasmodium.</td><td>False</td></tr><tr><td>There is evidence that bonifica was successful.</td><td>True</td></tr><tr><td>Plasmodium is passed from person to person.</td><td>False</td></tr></table>
4 correct = 3 marks
2/3 correct = 2 marks
1 correct = 1 mark
0 correct = 0 marks</td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Anopheles</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>Stop mosquitos getting in (and biting people)</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>Petrol is flammable (OWTTE)/ {oil/petrol} is a pollutant/ insecticide is poisonous/</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td></td><td>The more money spent the fewer deaths</td><td></td><td></td><td>1</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td></td><td>Preventing (1)
Killing (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td colspan="4"></td><td>Total mark for question 3</td><td>3</td><td>2</td><td>4</td><td>9</td><td>0</td><td>0</td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		A – Cornea B - Optic Nerve C – Retina	3			3		
		(ii)		(Changes shape to) focus light (onto retina)	1			1		
	(b)			50.24/ 50.2/ 50mm = 2 marks r^2 = 16 (mm^2) = 1 mark Allow 50.27 / 50.3 (if π used on calculator}		2		2	2	
	(c)			Decrease		1		1		
				Total mark for question 4	**4**	**3**	**0**	**7**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Diagram A = 36 and 36 (1) Diagram B = 18 and 18 and 18 and 18 (1)		2		2		
		(ii)		A = mitosis (correct spelling)		1		1		
		(iii)		Cancer	1			1		
	(b)			T ⎫ = 1 mark A ⎭ G = 1 mark		2		2		
	(c)	(i)		Meerkat and mongoose (1) Most similar banding pattern (1) accept bars / lines for bands		1	1	2		
		(ii)		Criminal cases/ paternity/identifying dead bodies	1			1		
				Total mark for question 5	**2**	**6**	**1**	**9**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			38		1		1	1	
	(b)			Eleri			1	1		1
	(c)			Tired/ Not done at the same time			1	1		1
	(d)			**Any two (×1) from:** • Height of student (1) • Distance from machine (1) • Length of arms (1) • Eyesight (1) • Brightness of flash (1)			2	2		2
	(e)			**Any two (×1) from:** • Fast (1) • Automatic (1) • Protective (1)	2			2		
				Total mark for question 6	**2**	**1**	**4**	**7**	**1**	**4**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		A – Kidney (1) B – Bladder (1) C – Urethra (correct spelling) (1)	3			3		
		(ii)		Downwards		1				
	(b)	(i)		Diabetes (1) Glucose in the urine (1)		2				
		(ii)		• Wear eye protection • Add drops of Benedicts • To urine sample • Put boiling tube into beaker/ waterbath • Using test tube holder • Heat water bath strongly/ 70 ºC • Using Bunsen • Sophie = green/yellow/orange/(brick) red • Ethan = (stays) blue **5-6 marks** At least 7 points from 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	3				6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				3-4 marks At least 4 points from 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 1 point from 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.*						
				Total mark for question 7	**6**	**6**	**0**	**12**	**0**	**6**

Overlap

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/1	(a)			• Use quadrats (1) • Correct reference to setting up a grid/ use a transect (1) • Correct reference to generation of <u>random</u> co-ordinates/ placing quadrat at regular intervals (1) • Count number of plants of each species (1) Accept reference to how the sample areas are chosen	4			4		4
	(b)	(i)		correct answer = 146.666666666667% (2) Accept any correct rounding If incorrect award 1 mark any of: 146% (1) Ref to 37-15 (1) Ref to 22 (1)		2		2	2	
		(ii)		Number of species has increased (1) Number of each species has increased /new species introduced (1)		2		2		
	(c)	(i)		**Any one (×1) from:** • To ensure the results were representative of the whole area (1) • To increase confidence in their conclusion (1) • To increase validity of their conclusion (1)			1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**Any one (×1) from:** Carry out sample at the same time each year (1) Use same sample {sites/ area} each year (1)			1	1		1
				Total mark for question 8/1	**4**	**4**	**2**	**10**	**2**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/2	(a)	(i)		Avoids confusion / name is universal	1			1		
		(ii)		presence of hairs on peaches / ORA (1) prevents spores landing on surface of fruit / ORA (1)			2	2		
	(b)	(i)		different {form/type/version/variation} of {a /the same gene}	1			1		
		(ii)		change in a {DNA molecule/ gene/ chromosome/genetic material} reject change in genetics	1			1		
		(iii)		(Ionising radiation)/ any correct mutagen	1			1		
	(c)	(i)		correct genotype Hh x Hh (1) correct gametes (1) ecf from genotypes Correct mechanics (1) ecf from gametes		3		3		
		(ii)		25% / 1 in 4 / ¼ / 0.25 (1) ecf from Punnett Square		1		1	1	
				Total mark for question 9/2	**4**	**4**	**2**	**10**	**1**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Bacteria	1			1		
		(ii)		{Bacteria/ *S. aureus*} not killed by {antibiotic/ methicillin}	1			1		
	(b)	(i)		Increases up till {2005 / 2006} then decreases		1		1		1
		(ii)		**Any one (x1) from:** • Handwashing/ Use of alcohol gels/ thorough cleaning of hospital wards (1) • MRSA screening (1) • doctors prescribing less antibiotics (1) • less use of antibiotics in animal feed (1) • development of new medicines (1)			1	1		2
				Total mark for question 3	**2**	**1**	**1**	**4**	**0**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			A = Sweat gland B= erector muscle 2 correct = 1 mark 0 or 1 correct = 0 marks	1			1		
	(b)			• {B / erector muscle/ it} contracts (1) • Hair stands {erect /up} (1) • Layer of <u>air</u> trapped next to surface of skin which acts as an <u>insulating</u> layer (1)	2	1		3		
	(c)			• Vasoconstriction / {blood vessels/C} {narrow/constrict/ close} (1) reject ref to blood vessels moving • {Less/ no} blood flows to {fingers/toes/nose/ears/cheeks/skin}/ leading to lack of oxygen (1)			2	2		
				Total mark for question 4	**3**	**1**	**2**	**6**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Cutting DNA into short {pieces/sections/fragments/bits/parts} (1) reject strands which are then separated into bands (1)	2			2		
	(b)			Asexual (reproduction) (1) Genetically identical to their mother/ clones of their mother/ contain {two X chromosomes/ XX} (1)		2		2		
				Total mark for question 5	**2**	**2**	**0**	**4**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		DNA (1)	1			1		
		(ii)		• Order of bases (in gene for GFP) / triplet code in correct context/ every three bases (1) • {Determine / identify} (particular) amino acids in GFP (1) reject amino acids made/created • Joined into the right order to make GFP (1) GFP only needs to be mentioned once		3		3		
	(b)			**Any one (x1) from:** • Fears about fish escaping and breeding with wild populations (1) • Escape of genes to wild populations (1) • Unknown long-term effects (1) • {Ethical/moral} issues of production of genetically modified organisms (1)			1	1		
				Total mark for question 6	**1**	**3**	**1**	**5**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		$\frac{37}{41000}$ x 1000= 0.9 (1)		1		1	1	
		(ii)		**Any one (x1) from:** • Media stories (1) • social media (1) • religious views (1) • side effects (1) • low chance of catching disease (1)			1	1		
	(b)			**Any four (x1) from:** A. Measles antigen (from initial encounter) (1) B. Lymphoctes produce {specific antibodies/antibodoes which destroy measles antigens} C memory cells produced (1) D. measles encountered again -{large numbers of antibodies produced / antibodies very quickly} (1) E. The antibodies destroy any antigens/ pathogens before any symptoms are produced (1) Penalise only once if answer refers to immunisation	1 1	1 1		4		
	(c)	(i)		Fragments are inactive / bacteria {not alive / attenuated/weakened}		1		1		
		(ii)		{Memory cells / immune response} are specific/ different antigens		1		1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			Information <u>from DNA</u> can be used to develop new {treatments / drugs / cure} / prevent diseases	1			1		
				Total mark for question 7	**3**	**5**	**1**	**9**	**1**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		**Any one (x1) from:** • glucose in urine (1) • thirst (1) • urinating a lot (1) • lethargy OWTTE (1) • low insulin levels	1			1		
		(ii)		Type 1 – {body/ pancreas} does not produce insulin (1) Type 2 - body cells not responding to insulin (1)	2			2		
		(iii)		**Any one (x1) from:** • low {sugar/carbohydrate diet} (1) • transplant of pancreatic tissue (1) • metformin tablets (1)	1			1		
	(b)			Pancreas (1) releases glucagon (into blood) (1) (Stored) glycogen (in liver) converted back into glucose (1) Correct spelling of glucagon and glycogen only	1 1	1		3		
	(c)	(i)		45.0736301 : 1 Accept any correct rounding		1		1	1	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)	I	Ethnicity has no effect on prevalence of Type 1 diabetes			1	1		
			II	• Asian people have a higher prevalence of Type 2 diabetes (1) • White people with type 2 lower prevalence than that in the whole population (1) • Black people have a higher prevalence of Type 2 diabetes (1)			1	1		
	(d)			Data only includes data for young people up to 25 / No data for people older than 24 (1)			1	1		1
				Total mark for question 8	**6**	**2**	**3**	**11**	**1**	**1**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		{Undifferentiated/ unspecialised} cells (1) that have the ability to {develop into specialised cells/differentiate} (1)	2			2		
		(ii)		mitosis (1) uncontrolled (1)	2			2		
	(b)	(i)		5.2		1		1	1	1
		(ii)		**Any one (x1) from:** • Young people's stem cells have divided a smaller number of times (1) • Older people's stem cells have divided a higher number of times (1) • The older you are the greater number of times your stem cells have divided (1)			1	1		
	(c)			Genetic		1		1		
				Total mark for question 9	**4**	**2**	**1**	**7**	**1**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)	(i)		**Any one (x1) from:** • Urea (1) • Water (1)	1			1		
		(ii)		Protein is not ultrafiltrated/ too large to be filtered (1) Glucose is reabsorbed (back into blood) (1) If both glucose and protein are reabsorbed/not filtered then 0 marks		2		2		
	(b)			Biuret solution (1) Blue to lilac / purple (1)	1	1		2		2
	(c)	(i)		96 dm^3 = 2 marks if answer correct, accept for 1 mark 240 x 400 96000		2		2	2	
		(ii)		Maintain concentration gradient (for urea)	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		**Indicative content:** • Dialysis happens by diffusion • Through (the pores of) the selectively permeable membrane. • Glucose not filtered out (of blood) • (because) concentration of blood and dialysis fluid is equal/ • (therefore) no net movement • Urea filtered out • Sodium/ chloride/ salts filtered out • Concentration of (urea/sodium/chloride/salts) greater in the blood than in the (fresh) dialysis fluid • protein not filtered out • molecules are too large to pass through the pores (of the selectively permeable membrane) **5-6 marks** At least 7 points from 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 4 points from 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	6		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks At least 1 point from 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.*						
				Total mark for question 10	**3**	**8**	**3**	**14**	**2**	**2**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

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

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

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