GCSE MARKING SCHEME

SUMMER 2022

GCSE
BIOLOGY (DOUBLE AWARD) - UNIT 4
3430U40-1 AND 3430UD0-1

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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.

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WJEC GCSE BIOLOGY (DOUBLE AWARD) – UNIT 4

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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.

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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

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Question 1				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			**Sense Organ** **Stimulus** Nose — chemicals in the air. Tongue — chemicals in food and drink Ear — sound Eye — light *3 correct for 2 marks* *2 correct for 1 mark.* *1 correct for 0 marks.*	2			2		
	(b)			Brain (1) Spinal cord (1) **NB brain and spinal cord in either order** Reflex (1)	3			2		
				Total mark for question 1	**5**	**0**	**0**	**5**	**0**	**0**

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Question 2				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			A – hair (1) B – (hair) erector muscle (1) C – sweat gland (1)	3			3		
	(b)			**Any one (×1) from:** (Produces) sweat (1) Hairs lie {flat/ down} (1) Reject go down Vasodilation /blood vessels {widen/ get wider/ dilate} (1) Reject blood vessels {get closer to the surface/ expand/ get bigger}	1			1		
				Total mark for question 2	**4**	**0**	**0**	**4**	**0**	**0**

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Question 3				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			{Arrow/ line} pointing to nucleus Must touch nucleus	1			1		
	(b)			Double helix	1			1		
	(c)			G – C	1			1		
	(d)			Protein	1			1		
				Total mark for question 3	**4**	**0**	**0**	**4**	**0**	**0**

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Question 4				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			*Rattus* Reject Rattus norvegicus		1		1		
	(b)			backbone/ spinal column Reject spine/ spinal cord	1			1		
	(c)			C A **D E B** All three correct = 2 marks Two correct = 1 mark 0/1 = 0 marks		2		2		
	(d)			Extinct/ extinction	1			1		
				Total mark for question 4	**2**	**3**	**0**	**5**	**0**	**0**

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Question 5				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			***False*** False True True 3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks		2		2		
	(b)			More cases / increases/ rises/ more get ill Ignore spread			1	1		
	(c)	(i)		2014		1		1	1	
		(ii)		**Any one (×1) from:** Successful because {%/ vaccines/ % vaccinations/ vaccinations/ it} went up (1) Reject numbers went up Unsuccessful as {target / 95%} vaccinated has never been reached (1) Quite successful but failed to meet 95% target (1)			1	1		
		(iii)		Parents were {concerned about autism/ thought the report was true} Ignore side effects			1	1		
				Total mark for question 5	**0**	**3**	**3**	**6**	**1**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		47.3684210 = 2 marks (Any correct rounding) If incorrect award 1 mark for any of 47.3/ 47.36/ 48 (incorrect rounding) $\frac{19-10}{19} \times 100$ 9/19 x100		2		2	2	
		(ii)		**Any two (×1) from:** Predator/ predation/ eggs being taken/ hunted/ poached (1) Disease/ virus/ bacteria (1) Poisoning/ Bioaccumulation/ or description of (1) {Competition for/ Not enough} {food/ prey} (1) Reject no food {Competition for/ Not enough} {space/ nests/ nesting sites}/ habitat destruction (1) Migration/ moved to another area (1) Reject pollution			2	2		
	(b)			Coast/ cliffs/ near {sea/ ocean/ shore} (1) Ignore near water Difficult for predators to get to them/ (close to) {food/ fish/ prey} (1)		1	1	2		
	(c)			Same genus/ both *Falco* Reject same genes			1	1		
				Total mark for question 6	**0**	**3**	**4**	**7**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		(As time goes on the blood glucose level) increases **and** then decreases (1) It reaches a peak at 4(pm)/ 130 (au) (1)		1 1		1 1	1	2
		(ii)		50 or 80 to 130 or 130 to 80		1		1	1	1
		(iii)		**Any one (x1) from** • increase above {maximum/ normal/ 175} (blood glucose level)/ • decrease below {minimum/ normal/ 75} (blood glucose level)/ • (blood glucose level) takes longer to return to normal/ • graph would go outside normal range/ • increase would be faster/ • decrease would be slower			1	1	1	1
	(b)	(i)		Benedicts (1) Heat (strongly)/ boil (1)	2			2		2
		(ii)		(Stays) blue/ no colour change/ negative/ no glucose Reject turns blue			1	1		1
	(c)			Insulin	1			1		
				Total mark for question 7	**3**	**3**	**2**	**8**	**3**	**7**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8				**Indicative content:** ***Similarities***: • Both have genes • Neither have a nucleus ***Differences***: • Bacteria have cytoplasm, viruses do not. • Bacteria have cell membrane, viruses do not. • Bacteria have cell wall, viruses do not. • Differences in shape/ e.g. bacteria – long, viruses round • Bacteria are larger / reference to size • Virus have a protein coat, bacteria does not. • Bacteria have flagella viruses do not **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.*		6		6		

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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 8	**0**	**6**	**0**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9/1	(a)			Change in {Genes/DNA/chromosomes/ genetic material/ base sequence/ genetic make up} Reject different DNA	1			1		
	(b)			(Ionising) radiation/ UV light/ x rays/ gamma rays/ carcinogens	1			1		
	(c)	(i)		Gametes correct (1) Offspring genotypes correct (1) **N** **n** **N** **NN** **Nn** **n** **Nn** **nn** If gametes incorrect 0 marks. Allow 1 ECF mark for genotypes If incorrect letters used 0 marks for gametes 1 ECF mark for genotypes. If X, Y used 0 marks for Punnett square		1 1		2		
		(ii)		25%/ ¼ / 0.25 Reject any ratios/ 25 unqualified/ 2/8 Ecf from (i) if relates to homozygous recessive genotype in Punnett square			1	1		
	(d)	(i)		Gene therapy/ somatic cell therapy Reject gene treatment	1			1		
		(ii)		Aerosol/inhaler Reject asthma inhaler/ inhaling	1			1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		**Any one (×1) from:** Has to be repeated / is not permanent/ only temporary/ short term/ not a cure (1) Genes not passed on (1) Low numbers of cells take up gene (1) difficulty in targeting appropriate cells (1)	1			1		
				Question 9/1 total	**5**	**2**	**1**	**8**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10/2	(a)	(i)		15 circled			1	1		1
		(ii)		4.6 or 5 = 2 marks If incorrect award 1 mark for: 6.3 or 6 (if do use 15) Ecf from (i)		2		2	2	
	(b)			**Any one (×1) from:** Not enough {quadrats/repeats} / only used 6 quadrats (1) small sample size/ more samples needed (1) Reject not enough results			1	1		1
	(c)			33 810 / 36 750 = 2 marks If incorrect award 1 mark for 4.6×7350 5 x 7350 **Or** 46 305 / 44 100 = 2 marks If incorrect award 1 mark for 6.3×7350 6 x 7350 Ecf from (a)(ii) Award 2 marks for Mean from(a)(ii) x 7350 = correct answer Award 1 mark for Mean from(a)(ii) x 7350 = incorrect answer		2		2	2	
	(d)			Transect	1			1		**1**
				Question 10/2 total	**1**	**4**	**2**	**7**	**4**	**3**

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Question 3				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		1. Pancreas (1) 2. Pancreas (1) 3. Liver (1) Penalise pancrease once	3			3		
		(ii)		(The way in which animals) {keep/ maintain} the {conditions/ named condition} inside (the body) {constant/ the same/ at optimum levels/ level} (OWTTE)	1			1		
		(iii)		Hormones	1			1		
		(iv)		Negative feedback	1			1		
	(b)	(i)	I	**Any three (×1) from:** • Production of insulin is low/ does not have enough insulin (1) Reject reference to low number of insulin • Slow fall in blood glucose level (1) • Blood glucose does not return to starting level (1) • Blood glucose is high {before glucose solution is drunk/ at start} (1) ORA may be acceptable here Ignore references to Rhys			3	3		
			II	Type 2 **and** because some insulin is produced/Type 1 diabetics don't produce any insulin			1	1		

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Question 3				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**Any two (×1) from:** • Injections of insulin/ insulin pump (1) • Low {fat/sugar/starch/carbohydrate/ calorie} diet (1) Ignore {good/ healthy/ balanced} diet • {Pancreatic tissue/ pancreas/ islets of Langerhans} transplant (1) • {Regular/daily} physical exercise (1) • Metformin (tablets) (or any other correct oral medicine) (1)	2			2		
				Question 3 total	**8**	**0**	**4**	**12**	**0**	**0**

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Question 4				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	I. II	**Both correct for 1 mark** 1:1 Do not accept 33 : 33 or 1:1 % 1:1 Do not accept 17 : 17 or 1:1 %		1		1	1	1
		(ii)		A(denine) & t(hymine) and g(uanine) & c(ytosine) are <u>complementary</u> (bases) (1) They are (always) found in pairs (in the DNA molecule) (1)		2		2		
		(iii)		The ratio(s) of A:T and G:C ,{would have been the same/would have been 1:1} (1) Percentage of the bases would have been different (different species) (1)			2	2		
	(b)			{Three bases/triplet/ codon} (1) **Any one (x1) from** code for an amino acid (1) determines {the sequence of/ which/ the order} amino acids link together to form a protein (1)	2			2		
				Question 4 total	**2**	**3**	**2**	**7**	**1**	**1**

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Question 5				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Phagocyte		1		1		
		(ii)		Destroyed/digested/broken down Ignore ingest Reject die/ / killed		1		1		
	(b)	(i)		{Vaccine/ {attenuated/ weakened/ dead} virus} contains antigens (1) antigens {stimulate/ cause/ make} the lymphocytes (1) produce antibodies (1)		3		3		
		(ii)		• 2nd vaccination /booster (vaccine)/ second dose (1) • has caught the virus / exposed to the virus / infected with the virus (1)		2		2		
		(iii)		Memory (cell)		1		1		
		(iv)		Immune/ immunity		1		1		
	(c)	(i)		It decreased/ Vaccination coverage decreased/ fewer {children/ people} vaccinated/ decrease in vaccinations			1	1		
		(ii)		Line extending between 1996 and 2010 (1) Must reach each axis Mirroring, but reciprocal to, the curve shown by the tops of the bars. (1) No lag in the data is required.		2		2		
				Question 5 total	**0**	**11**	**1**	**12**	**0**	**0**

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Question 6				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content:** **Mitosis:** • occurs in body (cells) • one cell divides into two/ two (daughter) cells produced • genetically identical cells/correct ref to chromosome number (46) same number of chromosomes as parent cell/ genetically identical to the parent cell/ clones *for* • growth/ asexual reproduction • replacement of worn out cells/repair (damaged tissues) **Meiosis** • occurs in {sex organs/ ovary/ testes/ anther} • one cell divides into four • genetically different cells/correct ref to chromosome number (23)/ half the number of chromosomes as the parent cell *for* • production of gametes/ sex cells/ sperm/ eggs **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.*						

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Question 6				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	**6**	**0**	**0**	**6**	**0**	**0**

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Question 7				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)		25 = 2 marks Award 1 mark for either of $\frac{7 \times 7}{2}$ 24.5		2		2	2	2
		(ii)		Capture/ recapture estimate is higher/. ORA Ecf Answer must relate to (a)(i)		1		1		
		(iii)		**Any two (x1) from** • using more traps (1) • Leave a longer time period between the 1st and 2nd capture (1) • Repeat {experiment/ whole process/ sampling}/ do it again (1)			2	2		2
	(b)			• No death/ no birth (1) Ignore reproduction • No immigration/ no emigration/ or description of (1) • Marking does not affect chance of survival (1)	2	1		3		
				Question 7 total	**2**	**4**	**2**	**8**	**2**	**4**

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FOUNDATION

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

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

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HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

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

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