GCSE MARKING SCHEME

SUMMER 2019

GCSE (NEW)
BIOLOGY - UNIT 2
3400U20-1 AND 3400UB0-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 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 2019 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

<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>1</td><td>(a)</td><td>(i)</td><td></td><td>False/ F/ ×
True/ T/ ✓
True/ T/ ✓
True/ T/ ✓
4 correct = 3 marks 3 correct = 2 marks 2 correct =1 mark</td><td>1</td><td>2</td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>blood</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>Any two (×1) from
<table><tr><td>(Researchers/ they)</td><td>Hospital</td></tr><tr><td>Large(r) number of people/ they used 600 people (1)</td><td>Small(er) number of people/ hospital used (only) 10 people (1)</td></tr><tr><td>for a long(er) (time)/ over two years (1)</td><td>Short(er) time/ (only) 1 month (1)</td></tr><tr><td>used placebo / used two groups in test / did not know whether had drug or not (1)</td><td>Did not use placebo/ only one group/ all knew they had the drug (1)</td></tr></table>If use hospital must be clear</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>(tablet that) does not contain any of the drug</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>As a control /comparison/ To ensure that the effects seen are caused by the drug / to see if there is a difference between the placebo and the drug</td><td>1</td><td></td><td></td><td>1</td><td></td><td>1</td></tr>
<tr><td></td><td></td><td>(iv)</td><td></td><td>C</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td></td><td>• Fewer <u>ethical</u> problems /
• (Computer programs/ tissue culture/ they) will give <u>more</u> similar results to the human body/ Animals (are different species and may) give different results (from humans)/
• Computer programmes generate large quantities of data more rapidly</td><td></td><td></td><td>1</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Total for question 1</td><td>5</td><td>4</td><td>1</td><td>10</td><td>0</td><td>1</td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	*(a)*	(i)		Fair testing / or description of/ different volumes of milk {will have different numbers of bacteria/ give different number of colonies} Accept reverse answer	1			1		1
		(i)		Flame loop/ use Bunsen burner/ make it red hot (1) {kill/ destroy} bacteria/ reference to aseptic (1)		2		2		2
		(iii)		Cover with lid + {secure with tape / sealed}	1			1		2
	(b)	(i)	I	Scale correct with label -Time (of storage) hours (1)		1		1	4	
			II	All correct plots 2 marks 4 correct plots 1 mark		2		2		
			III	Accurate line + label - 35 °C (1)		1		1		
		(ii)		(At all three temperatures) bacteria increase over time (1) Higher temperature gives increase in bacteria (1)			2	2		
		(iii)	I	6 = 2 marks Accept any answer 5 - 7 9.5-3.5 = 1 mark		2		2		
			II	50	1			1		
	(c)			• (Storage temperature was) too high, allows bacterial growth (1) • {no/ open lid} allows {bacteria/microorganisms} to enter (1) • (Bacterial growth in) yogurt could cause infection / food poisoning/ cause {gut/ stomach/ intestinal} infection (1) Do not credit illness/ sick			1 1 1	3		
				Total for question 2	**3**	**8**	**5**	**16**	**4**	**5**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	*(a)*	(i)		Forms a barrier (against microorganisms)/ stops bacteria/owtte Reject disease	1			1		
		(ii)		**A** erector muscle (1) **B** sweat gland (1)	2			2		
	(b)			***Indicative content:*** • Reduces heat loss/ retains heat • Erector muscles contract, • Hairs become erect, • Traps layer of air/ insulates/ restrict air movement on surface, • Sweating reduced / no sweat • {Decreased/ no} evaporation (from skin surface) • Blood vessels constrict, become narrower/ vasoconstriction • Less blood near skin surface • Shivering – releases heat (energy) **5-6 mark** Three elements,7-9 indicative points; *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.*						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				3-4 marks 4-6 points of 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** 1-3 points of 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.*	3	3		6		
				Total marks for question 3	**6**	**3**	**0**	**9**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	*(a)*	(i)		*Bordetella pertussis*	1			1		
		(ii)		Antigens , Lymphocytes Antibodies All 3 correct = 2 marks 2 correct = 1 mark	2			2		
	(b)			B			1	1		
	(c)	(i)		286.5/ 287(%) = 2 marks 7 730 - 2 000 / 2 000 × 100 If incorrect award 1 mark for either Method correct with incorrect answer 286		2		**2**	**2**	
		(ii)		When vaccination rate {high/at target /95%} the number of cases was low. (1) When vaccination rate was {low/ decreased} number of cases {was high/ increased} (1)			2	**2**		
	(d)	(i)		(Whooping cough is) {serious /fatal/ can kill} (1) Vaccination rates are below {target percentage/ 95%} (1)			2	**2**		
		(ii)		Parental freedom of {choice /responsibility} / against religious beliefs/ (Worries) about side effects/ causes {harm/ allergies} Accept reference to concerns about autism e.g. they think it causes autism		1		**1**		
	(e)			(5) **1** (6) **2** (4) **3** All correct = 2 marks 2 correct = 1 mark		2		**2**		
				Total marks for question 4	**3**	**5**	**5**	**13**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	*(a)*			Biological control / biocontrol.	1			1		
	(b)	(i)		Prevention of <u>bias</u>	1			1		1
		(ii)		Any **three** (×1) from • Place tapes/ mark grid (1) • Roll dice/ random number generator (1) • To determine coordinates/ owtte (1) • Count plants in quadrat (1) • Repeat technique in both areas (1)	3			3		3
	(c)	(i)		3		1		1		
		(ii)	I	16 × 8 = 128		1		1	1	1
			II	128 × 3 = 384 ecf (i) × (ii)I		1		1	1	1
	(d)	(i)		The fungus has reduced the <u>number</u> of plants/ no fungus more plants			1	1		
		(ii)		Other (scientists) repeat the investigation/ check someone else's results	1			1		1
	(e)	(i)		To check if the fungus {does not/ does} {affect/ kill/ harm} {non-target/ other} {species/ organisms/ plants}		1		1		
		(ii)		(Biodiversity) would be reduced / it would be less	1			1		
				Total marks for question 5	**7**	**4**	**1**	**12**	**3**	**7**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6/1	*(a)*	(i)		23	1			1		
		(ii)		Male XY Female XX	1			1		
		(iii)		<table><tr><td></td><td>X</td><td>Y</td></tr><tr><td>X</td><td>XX</td><td>XY</td></tr><tr><td>X</td><td>XX</td><td>XY</td></tr></table> Correct gametes X and Y symbols only Correct mechanics Allow ecf from (ii) and from gametes to offspring		1 1		2		
	(b)	(i)		1.76 (to two dp) = 2 marks Female mean = 12.35 /7 = 1.7642 = 1 mark		`2		2	2	
		(ii)	I	Males are taller than females			1	1		1
			II	Investigation shows female average height is greater than males so hypothesis is not supported. Accept figures			1	1		2
			III	Increase sample size/ Should all be over 25 / all reached full height			1	1		
	(c)			Requesting information for heights (rather than measuring heights) Ignore references to conversion of units			1	1		1
				Total marks for Question 6/1	**2**	**4**	**4**	**10**	**2**	**4**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7/2	*(a)*			A form of a gene (1) Characteristic only shows {when no dominant allele present /when homozygous/ when two recessive alleles are present} / hidden if a dominant allele is present/ not seen in heterozygous condition (1)	2			2		
	(b)	(i)		Causes a change in {DNA /gene/ genetic code/ triplet code/ order of bases}	1			1		
		(ii)	I	1 and 2		1		1		
			II	No child will have CF. (1) 6 does not have the recessive CF allele and 5 gives only one allele to offspring (or other wording) (1)		2		2		
	(c)	(i)		Using an inhaler/ breathed in/ inhaled/ nebuliser	1			1		
		(ii)		The {DNA/genes} must enter the lung <u>cells</u> (1) The gene must function in the {cells/body}/ gene must enter {DNA/ nucleus} (1) Not a cure as lung cells with the new {gene/DNA} die / replaced by cells {without the {gene/ allele} with the CF mutation / recessive allele} (1)	2	1		**3**		
				Total for question 7/2	**6**	**4**	**0**	**10**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	*(a)*	(i)		(organ which) {responds to/ detects} {stimuli/ named stimulus}/ (an organ that) contains receptor cells (1)	1			1		
		(ii)		Brain **and** spinal cord (1) Reject spine/ backbone	1			1		
		(iii)		{Fast/ rapid/ instantaneous/ immediate} + {automatic/ without thought/ involuntary} + {Protective/ prevent injury} (1)	1			1		
	(b)	(i)		receptor correctly labelled at end of dendrites (1) Accept (i) as label		1		1		
		(ii)		motor neurone correctly labelled (1) Accept (ii) as label		1		1		
	(c)			Any **one** (×1) from • reflex actions {are slowed down / don't happen}/ • {no/ slower} response/ • {no/ slower} muscle contraction/ effector {does not work properly/ not stimulated}/ • Electrical impulses {do not travel/ travel slower} along motor neurone (1)			1	1		
				Total for Question 3	**3**	**2**	**1**	**6**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	*(a)*	(i)		Chlamydia trachomatis/ Chlamydia trachmatis (1)	1			1		
		(ii)		bacteria (1)	1			1		
	(b)			use of condoms / celibacy (1) NOT protection unqualified	1			1		
	(c)	(i)		3 876 = 2 marks Award 1 mark for 5 452 × 0.711 3 876.372 3 877/ 3 875		2		2	2	
		(ii)		7/ 7.407/ 7.4/ 7.41 = 2 marks **Award 1 mark for** 5 452 - 5 076 = 376 (376 ÷ 5 076) × 100		2		2	2	
	(d)			Any **two** (×1) from: Has been an increase in number of young people with chlamydia (1) Can lead to infertility (if not treated)/ causes conjunctivitis in babies (1) To try and reduce the number of cases of chlamydia (1) {Share information/ education} on {prevention methods/ safe sex} (1)			2	2		
				Total for Question 4	**3**	**4**	**2**	**9**	**4**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	*(a)*	(i)		Does not have a {vertebral column/ backbone} (1)	1			1		
		(ii)		• Avoids confusion {in different parts of the world / languages/ countries} • Avoid duplication caused by common names}/ • Name is universal/ recognised in all countries (1)	1			1		
	(b)	(i)		3762 = 2 marks **If incorrect award 1 mark for** (198 × 152) ÷ 8 30 096÷8		2		2	2	2
		(ii)		4 / 4.2 / 4.18 = 2 marks **If incorrect award 1 mark for** calculation of area 30 × 30=900 / 900 m^2 calculation of density 3762/900 ECF from (i)		2		2	2	2
	(c)			Any **two** (×1) from • no death • no immigration/emigration/ owtte • marking technique does not affect chances of survival • no births/ reproduction/ owtte	2			2		
	(d)			Any **one** (×1) from • survey more than one area of the parkland / • increase area sampled/ • repeat at different times of year/ • idea of reproducibility			1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(e)			Any **two for 1 mark** from: • do not litter • avoid trampling • replace snails in the area from which they were collected • minimise disturbance to other flora and fauna/ owtte • use non-toxic paint/ non-permanent paint/ use less obvious marking			1	1		1
				Total for Question 5	**4**	**4**	**2**	**10**	**4**	**7**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	*(a)*			correct labelling of aorta /i) (1) correct labelling of medulla/ (ii) (1)		2	0	2	0	0
	(b)			Indicative content • Brain {monitors/ controls} water levels • Water levels in blood low / blood is concentrated • (more) ADH released • into the blood • Correct ref to negative feedback/ osmoregulation • (More ADH =) <u>more</u> reabsorption (by kidney) • back into blood • Volume of urine is less / less urine • Concentrated urine **5-6 marks** 7-9 indicative points *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** 4-6 indicative points *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	0	6	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks 1-3 indicative points *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 for Question 6	**3**	**5**	**0**	**8**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	*(a)*			Cutting DNA (into short pieces) (1) which are then separated into bands (1)	2			2		
	(b)			{Some/half} of the lambs {bands/DNA} comes from the ram and {some/half} comes from the sheep (1) showing that the lamb is related to both the ram and the sheep (1)		1	1	2		
	(c)			Health benefit = {identifying/ predicting} {disease/ health issues} /early diagnosis leads to early treatment (1) Ethical concern = ownership issues / privacy / insurance problems/ embryonic screening leading to {designer babies/ abortion} (1)	1		1	2		
				Total for Question 7	**3**	**1**	**2**	**6**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	*(a)*			One bacterium will give rise to one colony/ 22 colonies on agar so 22 bacteria in original sample (1)	1			1		1
	(b)	(i)		36.5- 37.5 °C (1) human pathogen grows better at body temperature (1)			2	2		
		(ii)		Any **two** (×1) from: • Sterilisation of {dishes/agar} / use of {autoclave/ pressure cooker} for agar (1) • Glass spreader sterilised/ flamed (1) • Petri dish lid not raised too high (1) • Lids secured with tape (1) • Flame mouth of test tube (1) • Working close to bunsen burner (1)	2			2		2
	(c)			7.3×10^4 = 3 marks **(use of standard form)** **If incorrect award 2 marks for** Number of colonies/cm^3 = 22÷0.0003 = 73 333.33° 3×10^{-4} cm^3 73.3×10^3 7.3×10^x 7.6×10^4 (used 23 colonies instead of 22**)** **If incorrect award 1 mark** 0.3 ÷1 000 = 0.0003 = 1 mark Number of colonies/cm^3 = 23÷0.0003 = 76 666.66° (used 23 colonies instead of 22)		3		3	3	3
	(d)	(i)		Any value within range >3%≤4% (1)			1	1		1
		(ii)		Use (a range of) concentrations between 3 % and 4 % (1)			1	1		1
	(e)			Test on cells/ tissues (1) Test on (named) animals (1) Test on healthy {volunteers/ people} (1)	3			3		
				Total for Question 8	**6**	**3**	**4**	**13**	**3**	**8**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	*(a)*			Allows light in (to the eye) **/** {refracts/ bends} light (1)	1			1		
	(b)			{Undifferentiated/ unspecialised} cell can {develop/ change/ specialise/ differentiate} into other cells (1)	1			1		
	(c)			Mitosis (1) correct spelling only Produces {large/increased} number of cells (1) that are {genetically identical/clones} (1)		3		3		
	(d)			<u>No stem cells</u> available (from the eye) (1)			1	1		
	(e)			**Any two (×1) from:** • Do not have to use stem cells from embryos/ stem cell donor is not required • No rejection issues • No ethical issues • Less invasive Accept reverse argument for example 2		2		2		
				Total for Question 9	**2**	**5**	**1**	**8**	**0**	**0**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	4	1	10	0	1
2	3	8	5	16	4	5
3	6	3	0	9	0	0
4	3	5	5	13	2	0
5	7	4	1	12	3	7
6	2	4	4	10	2	4
7	6	4	0	10	0	0
TOTAL	32	32	16	80	11	17

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	4	4	10	2	4
2	6	4	0	10	0	0
3	3	2	1	6	0	0
4	3	4	2	9	4	0
5	4	4	2	10	4	7
6	3	5	0	8	0	0
7	3	1	2	6	0	0
8	6	3	4	13	3	8
9	2	5	1	8	0	0
TOTAL	32	32	16	80	13	19