



GCSE MARKING SCHEME

SUMMER 2018

**GCSE
BIOLOGY - COMPONENT 1
C400U10-1 and C400UA0-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2018 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.

EDUQAS GCSE BIOLOGY
COMPONENT 1 - CONCEPTS IN BIOLOGY
SUMMER 2018 MARK SCHEME
GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (except for the extended response question).

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

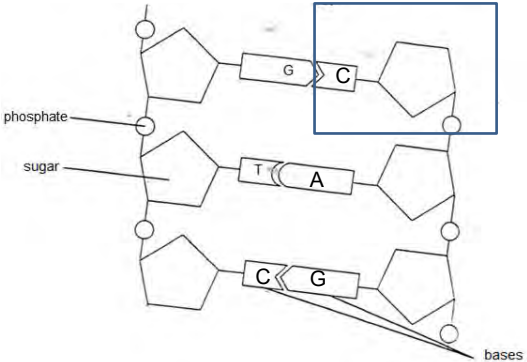
A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide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

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				Maths	Prac
					AO1	AO2	AO3	Total		
1	(a)	(i)	I	Labels – Cytoplasm (1) Cell membrane (1)		2		2		
			II	Nucleus drawn, in relation to position and proportions of photograph.	1			1		1
		(ii)		mitochondria	1			1		
		(iii)		No cell wall (1) No vacuole (1) No chloroplast (1)	3			3		
		(iv)		47/0.02 (1) 2350 (1) Correct method for working , incorrect answer = 1 mark		2		2	2	2
	(b)			Add chemical solution/methylene blue solution to <u>cells on slide</u> (1) Gently lower coverslip (1) Allows greater detail to be seen. (1)	3			3		3
				Question 1 total	8	4	0	12	2	5

Question			Marking details	Marks available				Maths	Prac
				AO1	AO2	AO3	Total		
2	(a)	(i)	any one (x1) from Not within nucleus (1) DNA – single loop/no chromosomes (1) Presence of plasmids (1)	1			1		
		(ii)	I  4 bases correct, 2 marks 3 bases correct 1 mark	2			2		
			II One nucleotide clearly shown – (phosphate and sugar with attached base)	1			1		
	(b)	(i)	Chiff-chaff – most closely related (1) Arctic warbler – least closely related (1) Relevant reference to number of matching bars (1)			3	3		
		(ii)	Chiff chaff most closely related but different common name/relevant reference to arctic warbler.			1	1		
	(c)	(i)	3:1		1		1	2	
		(ii)	Gg and Gg/heterozygous		1		1		
		(iii)	gametes correct (1) mechanics (1) ecf		2		2		
		(iv)	0%		1		1		
Question 2 total				4	5	4	13	2	0

Question					Marks available				Maths	Prac
					AO1	AO2	AO3	Total		
3	(a)			Carbon dioxide and water (accept correct formulae) Glucose	1			1		
	(b)	(i)	I	$45000/1880000 \times 100 = 2.39/2.4$ (1) 2 % = 2 marks		2		2	2	
			II	Plants {capture/absorb} only small percentage of solar energy which reaches them/relevant reference to reflected light (1)	1			1		
		(ii)		22 000 (kJ/m ² /year) in diagram and Respiration	1			1		
	(c)	(i)		Increase then plateau (1) Plateau at {650 (at 20° C)/35 bubbles per min}/bubbles start at 250 lux (1)		1	1	2	1	
		(ii)	I	44-29 =15 (2 marks)		2		2	2	
			II	enzymes involved (in photosynthesis) (1) More collisions at higher temperature (1)	2			2		
		(iii)		Any from: thermostatically controlled waterbath (1) digital temperature sensor (1) heat shield (water) between lamp and tubes (1)			1	1		2
		(iv)		<i>Cabomba</i> is an alien species which could be invasive (1) {Would compete/reduce numbers } native, local species/ref to relevant legislation in UK (1)			2	2		
				Question 3 total	5	5	4	14	5	2

Question			Marking details	Marks available				Maths	Prac
				AO1	AO2	AO3	Total		
4	(a)	(i)	Growth/{ repair/replace} damaged {cells/tissues}	1			1		
		(ii)	I 2 II 4	1			1		
	(b)	(i)	6 3 6 3 correct = 2 marks 2 correct = 1 mark 0/1/2 correct = 0 marks		2		2		
		(ii)	Mosquitos spread(parasite which causes) malaria (1) Sexual reproduction in mosquitos prevented/fewer eggs and sperm (1) Population of mosquitos reduced (1)	1	2		3		
	(c)	(i)	Undifferentiated stem cells develop/specialise Into tooth tissue cells	1			1		
		(ii)	No rejection/no need for tissue typing	1			1		
		(iii)	Potential loss of a life, distinguished from use of adult cells (a general reference to “ethical issues” is not enough)			1	1		
			Question 4 total	5	4	1	10	0	0

Question			Marking details	Marks available				Maths	Prac
				AO1	AO2	AO3	Total		
5	(a)	(i)	Both correct for 1 mark A Pulmonary artery B aorta	1			1		
		(ii)	Muscle (1) Left walls are thicker (1) Blood pumped a greater distance (1)	3			3		
		(iii)	back-flow of blood would occur (or eq. wording) (1) So reduced blood supply to lungs (to receive oxygen.) (1)		2		2		
	(b)	(i)	glucose	1			1		
		(ii)	platelets cause (excessive) blood clotting which can block the arteries (1)		1		2		
		(iii)	Balloon inflated (1) Blockage dispersed, (or eq. wording) (1) Blood flows freely in artery again. (1)	3			3		
			Question 5 total	8	3	0	11	0	0

Question			Marking details		Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		2.2 – 1.7 = 0.5 0.5/2.2 x100 =22.7 - 23 (to nearest whole number and recognised loss of mass)		1 1		2	2	
		(ii)	I	Axes scale		1		1	1	
			II	6 plots correct = 2 marks 5 plots correct = 1 mark 0/1/2/3/4 correct = 0 marks Allow ecf from (i)		2		2	2	
			III	clear line suitably drawn		1		1	1	
		(iii)	I	Increasing concentration results in loss of mass/reduces		1		1		
			II	Data from the graph as drawn – (allowing ecf) intersection of drawn line and x axis. (1) Equal movement of water <u>by osmosis</u> related to 0 change in mass/no net movement (1)			2	2	1	2
	(b)	(i)		increase the number of concentrations (1) Between relevant points (1)			2	2		
		(ii)		Any 2 (x1) from same potato/type of potato/age of potato (1) same diameter cork borer/same dimensions of cylinder (1) degree of drying (1) same temperature (1)			2	2		3
			(iii)	do the investigation again, to check repeatability/ Ask other group to do the investigation to check reproducibility			1	1		
			Question 6 total	0	7	7	14	7		

Question				Marking details	Marks available				Maths	Prac
					AO1	AO2	AO3	Total		
7	(a)	(i)		Routine use in farm animals (1) Treatments for minor infections (or eq. wording) (1)			1 1	2		
		(ii)		(semi) synthetic substances (1) Much time required for testing of new drugs before use in humans/checking for side effects (1)	2			2		
		(iii)	I	to avoid contamination by contact	1			1		
				II To destroy <i>Campylobacter</i> bacteria/relevant reference to enzymes	1			1		
				III to avoid <i>Campylobacter</i> bacteria multiplying/spreading		1		1		
	(b)			{Decay/decomposition/recycling} of nutrients/ Making nutrients available in the soil	1			1		
					Question 7 Total	5	1	2	8	0

Question		Marking details	Marks available				Maths	Prac
			AO1	AO2	AO3	Total		
8		QER						
	(a)	<p>Indicative content:</p> <ul style="list-style-type: none"> • Mutation/change in genes in one/few <i>Lolium</i> plants • Enabling survival of these plants in presence of glyphosate while others die • Only plants with resistant gene survived • And reproduced • resistance gene passed on to future generations • whole population becomes resistant <p>5-6 marks All of the above points including reference to glyphosate and <i>Lolium</i> does not have to be named.. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument.</i></p> <p>3-4 marks Resistant plants are mutants Survive the herbicide Reproduce/multiply Increase in numbers <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.</i></p>	1	5	0	6	0	0

Question			Marking details	Marks available				Maths	Prac
				AO1	AO2	AO3	Total		
			<p>1-2 marks Some plants change to become resistant These multiply. <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.</i></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
	(b)		<p>Any two (x1) from: Inability to pay increased costs for (newly developed) herbicides/pesticides (1) Inability to provide enough food for the population/relevant reference to food security as no other sources available (1) Too poor to be able to import food (1)</p>		2		2		
			Question 8 total	1	7	0	8	0	0

OVERLAP

Question				Marking details	Marks available				Maths	Prac
					AO1	AO2	AO3	Total		
9/1	(a)	(i)		A Thyroid (1) B Pancreas (1)	2			2		
		(ii)		Transported/travel <u>in the blood</u>	1			1		
		(iii)		Negative feedback/homeostasis	1			1		
	(b)			1. <u>Type 2</u> diabetes (1) 2. Glucose level is {not reduced/still rising} (by insulin)(1) 3. {No glycogen/less glycogen than Rhodri/lower level of glycogen} produced (from glucose)(1) 4. Insulin injection/{low/controlled} {carbohydrate/sugar} diet/named medication/regular exercise(1)	1 1	1 1		4		
	(c)	(i)		60 (a.u.)		1		1		
		(ii)	I	76 (a.u)		1		1		
			II	100 - 260 = 160 (1) 160/100 x100 = 160% Correct answer = 2 marks		2		2	2	
		(iii)		21 - 23 days and Curve for concentration reaches point of minimum effectiveness or equivalent wording.			1	1		
		(iv)		Any two advantages (x1) from: No need for repeated treatment/remembering to take daily pill(1) Lower level of hormone so less chance of side effects (1) Always above effective concentration (or eq wording) (1) Reject reference to implant lasting a long time one disadvantage (x1) from: Takes 8 days to be effective/takes longer to work (1) If a person changes their mind they have to wait a long time to {become pregnant/have a child} (1)			3	3		
				Question 9/1 total	6	6	4	16	2	0

Question				Marking detail	Marks available				Maths	Prac
					AO1	AO2	AO3	Total		
10/2	(a)	(i)	I	A= 5.7 B= 6.8 answers to 1dp, as pattern in table		1		1	1	
			II	A = 1425 B= 2550 ecf from I		1		1	1	
		(ii)		Number of bugle reduced in B and numbers of plantain increased in B (1) Bugle more affected by trampling (than plantain)/ Relevant reference to table of results/loss of bugle relatively much greater than increase in plantain(1)			2	2		
		(iii)		Any 2 (x1) from: <ul style="list-style-type: none"> • In A greater shading/lower light intensity because of trees • Availability of water – e.g. one field is further from stream • Less nutrient available in field A as it is taken by tree roots • Less wind in field A, protected by trees 		2		2		
	(b)	(i)		Reference to a random method by name or apparatus (1) Description of method to generate random coordinates, dice and tapes/or equivalent (1) Place quadrats (where coordinates meet), {identify/count/record} plants (1)	3			3		3
		(ii)		(To have sufficient data)for valid {results/conclusions}	1			1		1
	(c)	(i)		Number of species reduced (one lost)/Species B has been lost (1) Numbers of two species changed/C has reduced/ A has increased(1)		2		2		
		(ii)		Any two (x1) from Provides food (1) Industrial material (1) Medicines (1) Amenity value/leisure pursuits OWTTE Allows food chains to remain stable/OWTTE (1)	2			2		
				Question 10/2 total	6	6	2	14	2	4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Glucose + Oxygen (1) Carbon dioxide + water + {energy/ATP} (1)	2			2		
		(ii)		Glucose = lactic acid + {energy/ATP} (1)	1			1		
	(b)	(i)		Initially uses ATP (is available in cells) (1) Then Anaerobic respiration (provides most of the energy for the next minute)(1) Aerobic respiration then increases (1)			3	3		
		(ii)		<ul style="list-style-type: none"> Aerobic respiration {is more efficient/ releases more ATP per molecule of glucose/completely breaks down the glucose molecule} (1) ORA Anaerobic respiration causes cramp/pain (due to lactic acid) (1) After 120s aerobic releases 80% of energy compared to <25% from anaerobic respiration/aerobic respiration is providing x4 energy compared to anaerobic (1) 		2	1	3		
				Question 3 total	3	2	4	9	0	0

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Correct ordering of trophic levels – plants on bottom (1) Correct labelling – organism + biomass + units (1) Appropriate scale + correct plotting (1)		3		3	1	
	(b)	(i)		Any two (x1) from: <ul style="list-style-type: none"> {Repair/maintenance/growth} of cells (1) {waste/egestion/excretion/faeces/urine} (1) Heat lost/ respiration (1) 	2*			2		
		(ii)		Correct calculation of <u>both</u> transfers 1 st to 2 nd trophic level = 14/14.3/14.29/14.286/14.2857% and 2 nd to 3 rd trophic level = 10% (1) Transfer between 1 st and 2 nd trophic level/green plants to herbivores (1) Carnivores move more (to catch prey) and lose more energy (as heat) during respiration/ORAs (1)		1	2	3	1	
		(iii)		Any one (x1) from: <ul style="list-style-type: none"> Reflected (1) Incorrect wavelength (1) Used to evaporate water (1) Passes directly through leaf/misses chloroplasts (1) 		1		1		
	(c)	(i)		Any two (x1) from: <ul style="list-style-type: none"> Pyramid of biomass should be constructed using dry mass/variable water content of organisms (1) Correct ref. sampling error (1) Only living organisms collected/ORAs (1) Roots of plants not collected (1) Ref. time of collection/seasonal variation (1) 			2	2		2
		(ii)		Ref to sampling over period of time			1	1		1
Question 4 total					2	5	5	12	2	3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			33/33.5/34 mm (1) Conversion from mm to um/ORA; (1) 33000/400 = 82.5/83.75/85 (1) [for corresponding measurements above] Correct answer = 3 marks	1	2		3	2	3
	(b)			Diffusion	1			1		
	(c)	(i)		$2.48 \times 10^{-3} / 3.86 \times 10^{-6}$; (1) ignore number of decimal places =642 : 1/642.5:1/642.9:1/642.487:1 (1) Correct answer = 2 marks If not written as a ratio 1 mark only for 642		2		2	2	
		(ii)		As size increases the SA: volume ratio decreases (1) Specialised exchange surfaces needed because larger multicellular organisms do not have enough area in relation to size of organism to exchange substances by diffusion through body surfaces(1)		2		2		
				Question 5 total	2	6	0	8	4	3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			A - guard cell; (1)	1			1		1
	(b)	(i)		Stoma size is much bigger in light(1) Stomata {open/ close} in response to {light/darkness}(1) Control {water loss/transpiration}/allow gas exchange (1)	1		2	3		
		(ii)		Factor to be kept constant = temperature/wind speed/humidity (1) Control experiment = place the pot in a box/dark room (1)		1	1	2		2
	(c)	(i)		Axis labelled correctly with units (mean stoma size [a.u.] and rate of transpiration [$\mu\text{g}/\text{h}$]) (1) headings and units from table Appropriate scales chosen that use at least $\frac{1}{2}$ of graph paper for plotted points (including value at origin) (1) All plots correctly plotted with <1 small square tolerance (2) 1 error (1) >1 error (0) Appropriate line/curve of best fit(1) Accept plot to plot Do not accept a thick, double, wispy line	1 1			5	5	
		(ii)		Increasing mean stomatal size increases rate of transpiration up to {160a.u./120 $\mu\text{g}/\text{h}$ } then it remains constant(1) Any two (x1) from: <ul style="list-style-type: none"> (Rate of) {diffusion/evaporation} (from stoma) increases (1) Increased surface area of stomatal opening/owtte (1) Above {160 a.u./120 $\mu\text{g}/\text{h}$} other factors are limiting (rate of transpiration) (1) 		1	2	3		
				Question 6 total	4	5	5	14	5	3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)	I	Recessive – only expressed when two copies of the {allele/variant} present/not expressed in the presence of a dominant {allele/variant}	1			1		
			II	allele – different form of the same gene	1			1		
		(ii)		Mitosis	1			1		
		(iii)		1. Alleles differ in the arrangement of base sequences (1) 2. Order of bases forms {triplet/genetic} code(1) 3. Determines order of amino acids (1) 4. Linked to form proteins (1) 5. Proteins A and B are different with different sequences of amino acids (1)	4	1		5		
	(b)	(i)		phenotype: darker skin (pigment)/eumelanin (1) Genotype: Rr x Rr (1) Alleles correct (1) Correct mechanics (1) ecf 0.25/25%/1/4 (1) Ecf from candidates punnett square		5		5	1	
		(ii)		Correct ref. to method of reducing exposure (to UV radiation) to themselves(1)			1	1		
				Question 7 total	7	6	1	14	1	0

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)	<p>Indicative content:</p> <ul style="list-style-type: none"> • Africa as a continent has an adequate ADES supply. • ADES has increased in all parts of Africa since 1996. • North and western Africa have an adequate supply • Only middle Africa had ADE <100%. • An increasing human population - countries cannot produce enough food to feed their own population. • Countries are financially too poor to import food from other countries. • Conflicts have arisen which reduce food/water availability. • Effect of food being grown for export to wealthier countries. • New pests and pathogens appear but countries too poor to buy pesticides. • Lack of rainfall can result in crops failing causing widespread famine/water supply problems. • Extreme weather causing crop failure (e.g. tropical storms • Poor transport links <p>5-6 marks Detailed information from 3 areas used to formulate answer. <i>There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument.</i></p>	3	2	1	6		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				<p>3-4 marks Relevant information from 2 areas used to formulate answer. <i>There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.</i></p> <p>1-2 marks Some relevant information from 1 area used to formulate answer. <i>There is a basic line of reasoning which is not coherent, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.</i></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
	(b)	(i)		Gene in <i>Narcissus</i> and <i>Erwinia</i> identified/both genes identified/the genes are identified(1) Enzymes used to cut out gene (from DNA of both organisms)(1) Genes inserted into a {vector/plasmid} (1) Vector inserted into rice genome/nucleus(1)	1	3		4		
		(ii)		Spread of genes/moral and ethical concerns; (1)	1			1		
				Question 8 total	5	5	1	11		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		1. Mutation (1) 2. Producing (antibiotic) resistant <u>gene</u> (1) 3. Only the <i>Klebsiella</i> /bacteria with {resistant gene/mutation} survived in the presence of antibiotic treatment(1) 4. And reproduced to pass resistant gene on (to next generation) (1) 5. Over many generations, (proportion of population with resistant gene increases) (1)	2	3		5		
		(ii)		Use of antibiotics in animal feed (1) Over-prescription of antibiotics in humans/not completing courses of antibiotics (1)	2			2		
	(b)			Any two (x1) from <ul style="list-style-type: none"> • Correct ref. pre-clinical stage (1) • Test on cells <i>in vitro</i>/human cells(1) • Test on animals (1) Any two (x1) from <ul style="list-style-type: none"> • Correct ref. clinical stage (1) • Test on <u>healthy</u> volunteers (1) • Test on small group of volunteers/patients (1) Ref. monetary investment/ref. difficulty in culturing bacteria in laboratory/ref. only small number of drugs pass both pre-clinical and clinical stage testing; (1)	4		1	5		4
				Question 9 total	8	3	1	12	0	4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)	(i)		Synapse correct and unambiguous (1) sensory neurone correct and unambiguous (1)		2		2		
		(ii)		Brain	1			1		
		(iii)		Iris	1			1		
	(b)		The nervous impulse has only a short distance to travel/ Receptor and co-ordinator are close/eyes close to brain		1		1			
	(c)		<ol style="list-style-type: none"> 1. Retina of the (left) eye detects (bright) light (1) 2. Sensory neurone carries {electrical/nervous} impulse to {coordinator/brain} (1) 3. Synapse connects sensory neurone to {more than one/two} {connecting/relay} neurones (1) 4. Impulse carried by {both/two} motor neurones (1) 5. Causing {effector/iris} to contract in both eyes/causing pupil to {constrict/get smaller} in both eyes (1) 	3	1	1	5			
				Question 10 total	5	4	1	10	0	0

GCSE COMPONENT 1 – CONCEPTS IN BIOLOGY

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	8	4	0	12	2	5
2	4	5	4	13	1	0
3	5	5	4	14	5	2
4	5	4	1	10	0	0
5	8	3	0	11	0	0
6	0	7	7	14	7	5
7	5	1	2	8	0	0
8	1	7	0	8	0	0
9	6	6	4	16	2	0
10	6	6	2	14	2	4
FULL TOTALS	48	48	24	120	20	17

HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	6	6	4	16	2	0
2	6	6	2	14	2	4
3	3	2	4	9	0	0
4	2	5	5	12	2	3
5	2	6	0	8	4	3
6	4	5	5	14	5	3
7	7	6	1	14	1	0
8	5	5	1	11	0	0
9	8	3	1	12	0	4
10	5	4	1	10	0	0
Overall total	48	48	24	120	16	17