GCE A LEVEL MARKING SCHEME

SUMMER 2018

A LEVEL
BIOLOGY - COMPONENT 1
A400U10-1

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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.

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EDUQAS A LEVEL COMPONENT 1
ENERGY FOR LIFE

MARK SCHEME SUMMER 2018

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 statement. Award the middle mark in the level if most of the content statements are given and the communication statement is partially met. Award the lower mark if only the content statements are matched.

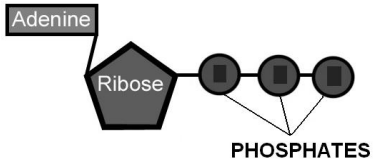
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Marking abbreviations

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				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			 Only one phosphate need be labelled. Pentagon shape with adenine and 3 phosphates coming off at correct points (1) Ignore shape of adenine Correct labels = ribose + adenine + phosphate (1) Accept adenosine if structures bracketed Reject pentose Reject base	2			2		
	(b)	(i)		40.4 = 2 marks $\frac{38 \times 7.3}{686}$ x 100 % = 40 = 1 mark incorrect dp Correct substitution into equation = 1 mark		2		2	2	
		(ii)		Approx {twice/ four times} as efficient / {20/30}% more ECF from (i)			1	1		
	(c)			Any four (x1) from: 1. Both involve proton pumps/ protons are pumped(1) 2. {Driven/ powered} by {electron (energy)/ redox reactions of ETC}(1) 3. Creation of {electro chemical/ proton/ chemiosmotic} gradient (1) 4. {Diffusion/ flow} of {hydrogen ions/ protons}/ protons {travel down/ pass through} {stalked particle/ carrier protein}/ chemiosmosis(1) 5. {through/ use} ATP synthase (synthesising ATP) (1) Accept synthetase		4		4		
	(d)			1. {Immediate/ initially/ first} source is stored ATP/ only enough ATP for approx {60 seconds/1 minute/ less than two minute}(1) NOT used up rapidly/ quickly 2. (Then) anaerobic glycolysis provides {ATP/ energy}/ there is a lack of oxygen for first 3 -4 minutes(1) Accept aerobic respiration 3. {From 5 minutes/ over five hours} aerobic respiration {is the only source of {ATP/ energy}/ aerobic respiration is maintained for 5/ several/ many/ 2+ hours (1) NOT longer periods/ longer time			3	3		3
				Question 1 total	**2**	**6**	**4**	**12**	**2**	**3**

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<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>(i)</td><td></td><td>Any two for 1 mark from
Have nucleus (1)
membrane-bound organelles/ named example(1)
80S ribosomes (1)
DNA associated in chromosomes/linear (1)</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>Absence of protein/S layer in Gram negative (1)
layer of {lipoproteins/lipopolysaccharides} (1)</td><td>1</td><td>1</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td>25 (% NaCl)</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>A Halobacterium salinarum + lives in a marine environment which has high NaCl conc (1)
B Staphylococcus aureus + lives on skin which is often high in salt (from sweat) (1)
C Escherichia coli + in part of gut with low salt (as most has been absorbed)(1)</td><td></td><td></td><td>3</td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>Grams staining/ or description of(1)
Accept reference to crystal violet only
Enterococcus faecalis/ Gram positive: purple {spherical/spheres} (1)
NOT round/ circle
Escherichia coli/ Gram negative: red {rods/bacilli/us} (1)
both correct colours = 1 mark
both correct shapes for 1 mark
Accept correct description of penicillin resistance</td><td>1</td><td>2</td><td></td><td>3</td><td></td><td>3</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td></td><td>
<table>
<tr><td></td><td></td><td>$x - \bar{x}$</td><td>$(x-\bar{x})^2$</td></tr>
<tr><td>1</td><td>275</td><td></td><td>324</td></tr>
<tr><td>2</td><td>293</td><td></td><td>0</td></tr>
<tr><td>3</td><td>310</td><td></td><td>289</td></tr>
<tr><td>Mean</td><td>293</td><td></td><td>∑613</td></tr>
</table>
∑ = 613 (1)
Square root of 613/2
Substitution = (1)
SD = 17.5 (1) must be to 1dp Correct answer = 3 marks</td><td></td><td>3</td><td></td><td>3</td><td>3</td><td></td></tr>
</table>

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		Clumping of bacteria/ Overlapping colonies/ Difficult to count large colony numbers Ignore reference to anomalies/ not enough repeats		1		1		1
		(iii)		data range is very large/10^{-3} is less reliable than 10^{-5}/ both unreliable as they have a large SD/ Data is very variable Reject accuracy/ unreliable unqualified		1		1		1
		(iv)		72 x 4 x 10^{9} (1) 2 880 000 000 000 (2) 2.9 x10^{11}/2.88 x10^{11} bacteria in 1cm^{3} (3) If do not use x 4 = 7.2 x 10^{10} = 1 mark		3		3	3	
				Question 2 total	**3**	**12**	**3**	**18**	**6**	**5**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Anaerobic conditions (1) Nitrates converted to atmospheric nitrogen/ less nitrification - qualified(1) **OR** Leaching(1) Nitrates washed out of the soil (1)		2		2		
	(b)			**Any three (x1) from** 1. Use of fertilisers (1) 2. Ploughing increasing aeration/increasing aerobic/decreasing anaerobic conditions (1) 3. Nitrification increases (1) 4. More nutrients in flood water increasing nitrate levels (1)		3		3		
	(c)			1. Land retains the water / acts as sponge (1) Not store flood water 2. Which is only released slowly into the rivers (1) 3. Reducing (flash-)floods (1) 4. Conflict between loss of farmland and conservation/cost of damage from flooding is more than farmers compensation for the loss of use of land(1) 5. Conservation (of rare species/example/ biodiversity) (1)			4	4		
	(d)	(i)		Use of transect **and** use of quadrats(1) Estimate of %cover/number/ frequency of each species (1) NOT count abundance Repeat at {points/ intervals} along footpath (1)	3			3		3

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<table>
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<tr><td>3</td><td>(d)</td><td>(ii)</td><td></td><td>There is a higher abundance of greater plantain in the centre of the path and a higher abundance of ribwort plantain at the edges of the path (1)

<table><tr><td>Greater plantain is better adapted to heavily trampled ground/ physical damage</td><td>or</td><td>Ribwort plantain is less well adapted to heavily trampled sites/ physical damage (1)</td></tr><tr><td>Greater plantain is very tolerant of drought</td><td>or</td><td>Ribwort plantain is less tolerant of drought(1)</td></tr><tr><td>Greater plantain has seeds which germinate best on open ground</td><td>or</td><td>Ribwort plantain has seeds which germinate best on lightly compacted soil(1)</td></tr></table></td><td></td><td></td><td>4</td><td>4</td><td></td><td></td></tr>
<tr><td></td><td>(e)</td><td>(i)</td><td></td><td>There is insufficient energy available to support a further trophic level (1)
NOT ‘not enough energy to support more than 6 energy transfers’
Energy is lost as metabolic heat/waste/through respiration when the organisms from one trophic level are consumed by organisms from the next level(1)
Fewer trophic levels means more energy available for human (food)(1)</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>Need to maintain body temperature (1) NOT keep warm
Which means they use (more) food in <u>respiration</u> to produce <u>heat</u> (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 3 total</td><td>4</td><td>9</td><td>8</td><td>21</td><td>0</td><td>3</td></tr>
</table>

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Homeostasis	1			1		
	(b)	(i)		Fatigue/tiredness/feeling dizzy/faint		1		1		
		(ii)		1. Glycogen broken down to use in respiration(1) 2. Partial hydrolysis of glycogen/ or description of/ cannot completely hydrolyse glycogen/ only 30% of the glycogen can be hydrolysed/ E1 enzyme cannot hydrolyse 1-4 glycosidic bonds (1) 3. No removal of 1-6 branch/ 1-6 bonds cannot be broken (1) 4. Less glucose can be released (1)		2	2	4		
	(c)			Mutation in the {gene/DNA}/ or description of (1) {1^{o} structure of protein/sequence of aa} is altered/ different polypeptide structure/ stop codon prevents translation (1) Active site wrong shape **so** {substrate/1-6 branches} no longer fit/ fewer enzyme-substrate complexes (1)	3			3		
	(d)			(Autosomal) recessive	1			1		
	(e)			More {branching/shorter 1,4 chains} in glycogen/ more coiling in amylose/ starch made up of amylose and amylopectin Reject 1,4 bonds	1			1		
				Question 4 total	**6**	**3**	**2**	**11**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		All plots correct = 2 marks Minus 1 for each incorrect plot [½ small square tolerance]		2		2	2	
		(ii)		29% (of max light intensity) [½ small square tolerance] **From candidates graph where line crosses x-axis**		1		1	1	1
		(iii)		• (At 29%) rates of photosynthesis and respiration would be equal (1) • The uptake of CO_2 by the plant through {Calvin cycle/ light independent reaction} is equal (1) • to its release of CO_2 through {link reaction and Krebs cycle/ or description of} (1) • At the compensation point there is no change in indicator colour/ stays red **because** there is {no change in the concentration of dissolved CO_2/no change in pH} (1)		4		4		
	(b)			Too inaccurate/ only gives qualitative data/ only subjective/ different people see different shades/ could be colour blind Accept reverse answer for use of colorimeter		1		1		1
	(c)			**Any two (x1) from:** size of algal balls (1) temperature (1) concentration of algae (1)			2	2		2
	(d)			Compensation point of maize high(er) than primrose/ORA (1) Maize {grows in fields/needs lots of sun/ light/ needs more light}/ Primrose {grows in shaded environment/woodland/ has efficient/effective photosynthesis in low light} (1) NOT shade plant unqualified			2	2		
	(e)			**Any five (x1) from:** 1. Algal bloom/ or description of (1) 2. Water out of river draining agricultural land (1) 3. contains nitrates/fertiliser/slurry/eq (1) 4. Causes high Nitrate levels in area shown (1) 5. Death **and** decay of {algae/plants (1) 6. O_2 used up by decay organisms/high BOD(1)	5			5		
				Question 5 total	**5**	**8**	**4**	**17**	**3**	**4**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			1. Overfished has increased **and** fully fished has increased **and** underfished has decreased (1) 2. fish stocks are decreasing/ some species could become extinct (1) 3. (because) increase in unsustainable fishing and a decrease in sustainable fishing (1) 4. Since 2007 overfished/biologically sustainable have stayed constant/ plateaus (1) 5. within sustainable fishing more fully fished and fewer underfished stocks (1) 6. Correct use of data in any mark point (1)			4	4		
	(b)			• Restricted/minimum net mesh size so don't catch {young/ smaller} fish (1) • Exclusion zones/Seasonal restrictions {so don't catch breeding fish/juveniles/ so stocks can recover}(1) • {Quotas/Smaller fleets} so less fish caught (1) Ignore ref to fishing for non-traditional species	3			3		
	(c)	(i)		Closely packed so {<u>lice/ parasites/ infection</u>} can easily spread from fish to fish (1) NOT disease Cannot be easily killed as resistant to pesticides (1)		2		2		
		(ii)		**Any three (x1) from:** • Foreign species into new areas/invasive species/ displace indigenous species / decrease biodiversity / reduce wild fish numbers/diversity of species (1) • Compete qualified (e.g. for food/ mates/ habitat)/affect food chains (1) • spread disease/ infection/ parasites to wild/ native fish (1) • Breed with the wild fish **and** reduce genetic diversity/ dilute the gene pool/ threaten the long-term survival of wild species/ cause wild species to go extinct (1)		3		3		
				Question 6 total	**3**	**5**	**4**	**12**	**0**	**0**

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Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7	*Link reaction and Krebs cycle* • Pyruvate transported in from cytoplasm • Correct description of link reaction • Decarboxylation and dehydrogenation to produce 2C Acetyl coenzyme A • Correct description of Krebs cycle • Correct description of 4C + Acetyl coenzyme A giving 6C molecule. • Progressive removal of C as CO_2 to reform 4C molecule • Removal of H/use of dehydrogenase/ use of decarboxylase • Formation of Reduced NAD and Reduced FAD *Electron transport chain* • Correct description of ETC • use of oxygen as final electron acceptor • Use of Reduced NAD and Reduced FAD as source of high energy electrons for ETC • Formation of an EC gradients/ chemiosmosis • subsequent synthesis of ATP by the use of ATP synthase in stalked particles *Benefits* • *Bacteria* have a source of pyruvate/oxygen • Constant environment e.g. pH/ water potential • Protection from predation • *Eukaryote* – increased ATP availability – increased metabolic rate/increased cell division/increased active transport/able to metabolise other respiratory substrates/e.g. fatty acids • Compartmentalisation • Increase in size/ complexity	7	2				

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Detailed content from Link reaction and Krebs **+** Electron Transport chain **+** Benefits *The candidate constructs an articulate, integrated account, correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses scientific conventions and vocabulary appropriately and accurately.* **4-6 marks** Content from any two parts out of Link reaction and Krebs Electron Transport chain Benefits *The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate usually uses scientific conventions and vocabulary appropriately and accurately.* **1-3 marks** Content from one part out of Link reaction and Krebs Or Electron Transport chain Or Benefits *The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate has limited use of scientific conventions and vocabulary.* **0 marks** *The candidate does not make any attempt or give a relevant answer worthy of credit.*						
				Question 7 total	**7**	**2**	**0**	**9**	**0**	**0**

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SUMMARY OF ASSESSMENT OBJECTIVES

A2 Component 1

Q	AO1	AO2	AO3	TOTAL	MATHS	PRAC
1	**2**	**6**	**4**	**12**	**2**	**3**
2	**3**	**12**	**3**	**18**	**6**	**5**
3	**4**	**9**	**8**	**21**	**0**	**3**
4	**6**	**3**	**2**	**11**	**0**	**0**
5	**5**	**8**	**4**	**17**	**3**	**4**
6	**3**	**5**	**4**	**12**	**0**	**0**
7	**7**	**2**	**0**	**9**	0	0
TOTAL	**30**	**45**	**25**	**100**	**11**	**15**

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