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# **GCE A LEVEL MARKING SCHEME**

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**SUMMER 2017**

**A LEVEL (NEW)  
BIOLOGY - UNIT 3  
1400U30-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2017 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.

**UNIT 3**  
**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 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.

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

## WJEC GCE BIOLOGY - HUMAN BIOLOGY

SUMMER 2017

## UNIT 3 MARK SCHEME

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
1	(a)	(i)	X ATP and Y Reduced NADP/ NADPH <sub>2</sub> / NADPH +H <sup>+</sup> / NADPH Not NAD	1			1		
		(ii)	RuBisCO/ carboxylase/ ribulose bi(s)phosphate carboxylase/ RuBP carboxylase	1			1		
	(b)		<b>Any five (x1) from:</b> A. (Initially), Carbon dioxide + RuBP reaction continues/ GP continues to be produced(1) B. GP cannot be {converted/ reduced} to TP (1) C. because ATP <b>and</b> reduced NADP are needed (1) D. ATP and reduced NADP {only produced in light/ not produced in dark}(1) E. (therefore) less TP available {to regenerate RuBP/ as it used produce glucose} (1) F. (Therefore) rate of reaction of carbon dioxide and RuBP decreases (1)		3	2	5		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths *	Prac **
1	(c)			<p>A. At 27°C {(rate of) respiration is lower than (the rate of) photosynthesis/ rate of photosynthesis is higher than (the rate of) respiration} (1)</p> <p>B. Therefore <u>more</u> {sugar/ glucose/ sucrose/ fructose} is produced (by photosynthesis) than is used (in respiration) (1)</p> <p>C. More {sugar/ glucose/ sucrose/ fructose} (stored) in <u>{fruit/ tomato}</u> (so sweeter tasting) (1)</p> <p><b>Accept answers referring to 40°C</b></p> <p>A. At 40°C rate of respiration is higher than (the rate of) photosynthesis/ rate of photosynthesis is lower than (rate of) respiration (1)</p> <p>B. Therefore <u>more</u> of the {sugar/ glucose/ sucrose/ fructose} produced by photosynthesis is used in respiration (1)</p> <p>C. Less {sugar/ glucose/ sucrose/ fructose} (stored) in <u>{fruit/ tomato}</u> (so less sweeter tasting) (1)</p>			3	3		
				<b>Question 1 total</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>10</b>	<b>0</b>	<b>0</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths *	Prac **
2	(a)			Allowing {sodium <u>ions</u> / $\text{Na}^+$ } to {rapidly diffuse/ flood/ rapid influx} <u>into</u> {neurone/ axon/cell} (1)  Brings about depolarisation of the axon / inside of neurone becomes positive with respect to outside / generation of action potential (1)	2			2		
	(b)			A. {sodium <u>ions</u> / $\text{Na}^+$ } can no longer enter/ fewer sodium ions enter (the axon)(1) B. Threshold is not reached(1) C. There is no action potential / no depolarisation (1) D. Along <u>sensory</u> neurone (to brain) (1)	2	2		4		
	(c)			Correct answer = $21 = 2$ marks Allow 1 mark for $7 \times \frac{60}{10} \times 0.5$ OR $7 \times 6 \times 0.5$ OR $7 \times \frac{60}{10} \times \frac{1}{2}$ OR $7 \times 6 \times \frac{1}{2}$		2		2	2	
	(d)			A. Calcium ions {do not <u>diffuse</u> / less <u>diffuse</u> } into the {synaptic knob/ presynaptic neurone/ across the presynaptic membrane}(1) B. Prevent (synaptic) vesicles from fusing with presynaptic membrane (1) C. Prevents {neurotransmitter/ acetylcholine} {release into the (synaptic) cleft/ synapse/ exocytosis} (1)		3		3		
<b>Question 2 total</b>					<b>4</b>	<b>7</b>	<b>0</b>	<b>11</b>	<b>2</b>	<b>0</b>

Question				Marking details	Marks Available						
					AO1	AO2	AO3	Total	Maths *	Prac **	
3	(a)	(i)		<b>Any four from:</b> A. Description of direction of fluid /countercurrent flow – maintains concentration gradient (1) B. replacement of dialysis fluid – maintains concentration gradient (1) C. Temperature/ 40 °C - increase rate of diffusion/maintains patient temperature/ prevents temperature shock (1) D. large number of tubes - increase surface area (1) E. pore size/ selectively permeable – prevents loss of (plasma) proteins(1)		2	2	4			
	(b)	(i)		27		1		1			
			(ii)		Posterior pituitary (gland)	1			1		
			(iii)		<b>Any five from</b> A. ADH makes membranes of {collecting duct/distal convoluted tubule} more permeable to water (1) B. ADH combines with receptor (1) C. Vesicles fuse with membrane on <u>collecting duct</u> side (1) D. Inserting <u>more</u> aquaporin into membrane (1) E. Water potential of filtrate is higher than water potential within {cell/ tissue fluid/ blood} OWTTE (1) F. Water moves into {epithelial cell / tissue fluid} by osmosis/ water leaves filtrate} by osmosis (1)		2	3	5		
	(c)			<u>Membrane</u> not made more permeable so more water stays in {filtrate/urine} / no aquaporins inserted into <u>membrane</u> so less water reabsorbed		1		1			
	(d)			Nn x nn (1) correct offspring genotypes (1) 1 in 2 / 0.5 / 50% / ½ (1) If incorrect parental genotypes can award second mark only for correct working Reject 1:1		3		3			
				<b>Question 3 total</b>	<b>1</b>	<b>9</b>	<b>5</b>	<b>15</b>	<b>0</b>		

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
4	(a)		18 = 3 marks 18.18/18.2 = 2 marks Substitution into equation = 1 mark $\frac{240}{3.3 \times (\log 10^4 / \log 10^1)} =$ Allow 24 for 3 marks 24.2 = 2 marks Substitution into equation = 1 mark $\frac{240}{3.3 \times (\log 10^4 / \log 10^1)} =$ 3 = 2 marks (use of hours instead of minutes) 3.3 = 1 mark (use of hours instead of minutes and not 1 dp)		3		3	3	
	(b)	(i)	death phase/ suitable description; (1) nutrient/glucose run out, build-up of toxic waste/toxins (1)	2			2		
		(ii)	Dead cells are included therefore there {are higher numbers/ numbers stay constant} (1) death phase cannot be identified (1)	1	1		2		
			<b>Question 4 total</b>	<b>3</b>	<b>4</b>		<b>7</b>	<b>3</b>	



Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
5	(a)	(i)	Make sure maggots do not come into contact with NaOH/ stop the maggots from drowning			1	1		1
		(ii)	Any two from <ul style="list-style-type: none"> <li>Gives time for the maggots to acclimatise to temp/conditions/ owtte(1)</li> <li>Gas may expand/contract(1)</li> <li>Time for {NaOH to equilibrate/equipment to equilibrate/ a {constant/ 25 °C} temperature} (1)</li> </ul>		2		2		2
		(iii)	<ul style="list-style-type: none"> <li>Carry out same experiment under same conditions with same {mass/volume } of {glass beads/ dead disinfected maggots}(1)</li> <li>Shows it is the respiration of maggots causing the (volume) change (1)</li> </ul>			2	2		
	(b)	(i)	Any two from: EXPT1. <ul style="list-style-type: none"> <li>Oxygen used by the maggots for <u>aerobic</u> respiration; (1)</li> <li><u>Released</u> CO<sub>2</sub> is absorbed by NaOH (1)</li> <li>Volume/pressure decreases in tube. (1)</li> </ul> EXPT2. Volume of O <sub>2</sub> used equal to volume of CO <sub>2</sub> evolved (1)			3	3		3
		(ii)	<ul style="list-style-type: none"> <li>increases {reliability / reproducibility} (of mean) (1) NOT accurate/ repeatability</li> <li>increase confidence / {exclude/ identify} anomalous results / allows use of {statistical test/ named statistical test} (1)</li> </ul>		2		2		2

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
5	(b)	(iii)	<p>27.6 mm<sup>3</sup> g<sup>-1</sup> minute<sup>-1</sup> = 3 marks            27.58 = 2 marks (not to 1 dp)            110.3 = 2 marks (Using diameter instead of radius)            110.32 = 1 mark (Using diameter and not to 1dp)            137.9 = 2 marks (Using 5 minutes)            13.8 = 2 marks (Using 0.5g)            13.79 = 1marks (Using 0.5g and not 1 dp)</p> <p>Cross sectional area of lumen. <math>\pi r^2 = 1.13\text{mm}^2</math>            Volume used = <math>1.13 \times 61 = 68.93\text{mm}^3</math>            Divide by 5 to give per minute = <math>13.8\text{mm}^3</math> per minute.            x 2 to give per g = <math>27.6 \text{mm}^3 \text{g}^{-1} \text{minute}^{-1}</math></p>		3		3	3	
	(c)	(i)	102/145 = 0.7/ 0.70/ 0.703		1		1	1	
		(ii)	Lack of water in environment (1) Produce {a <u>lot of metabolic</u> water/ a lot of water from respiration} (1)			2	2		
		(iii)	Glycogen does not need a large oxygen supply/ ORA (1) And does not need to remove a large amount of CO <sub>2</sub> /water/ ORA (1)			2	2		
			<b>Question 5 total</b>	<b>0</b>	<b>8</b>	<b>10</b>	<b>18</b>	<b>4</b>	<b>10</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
6	(a)	(i)	Lay out grid/ lay out two tapes (1) Random number {table/generator}/ use (10 sided) dice} to give coordinates (1) Avoids bias/ better representation of the whole area/ avoid user generated influence (1)	3			3		3
		(ii)	Secondary succession (1) colonised prior to being cleared, so {seeds/nutrients/ humus} already present(1) (secondary succession) changes environment and allows other species to grow (1)	2	1		3		
		(iii)	Increased (1) More habitats/ food sources/ niches (1)		2		2		
	(b)	(i)	Carry out nitrogen fixation (1) Nitrogen gas converted to nitrogen containing compounds/ ammonium ions(1) NOT nitrate Used by plants to make amino acids/proteins/DNA (1)	2	1		3		
		(ii)	A. (Leghaemoglobin) {combines/ binds} with the oxygen present (1) NOT leghaemoglobin absorbs oxygen B. Leghaemoglobin gives {anaerobic/ oxygen free/ low oxygen} conditions (in the root nodule)(1) C. <i>Rhizobium</i> only fixes nitrogen in {anaerobic/ oxygen free/ low oxygen } conditions(1)			3			

Question			Marking Details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
	(c)	(i)	stable community/no further succession/final community/ community has reached equilibrium (1)	1			1		
		(ii)	{Waterlogged soils/ conditions} {lack oxygen/ are anaerobic}(1) roots unable to respire aerobically/ active transport of minerals stops(1) <b>OR</b> Denitrification (1) lack of nitrate for trees (1)	1	1		2		
	(d)		Any three from: A. Nitrates are in low supply (1) B. It takes a lot of ATP to {absorb nitrates/fix nitrogen/ change nitrogen to ammonia} (1) C. More energy efficient to digest insects (than to fix nitrates) (1) D. Used as a N source from amino acids/protein/ nucleic acids; (1)			3	3		
			<b>Question 6 total</b>	<b>9</b>	<b>5</b>	<b>6</b>	<b>17</b>		<b>3</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths *	Prac **
7			<p><b><u>Indicative content</u></b></p> <p><b>Eutrophication</b></p> <ul style="list-style-type: none"> <li>• The nitrogen in the food fed to the fish may be lost as uneaten food, in faeces and as ammonia.</li> <li>• The extra N and P in the water can be used by algae to grow. This algal bloom at the water surface can block light to the aquatic plants in the deeper water.</li> <li>• With no light, these plants cannot photosynthesise and so die.</li> <li>• Decomposers (bacteria and fungi) will then decompose the dead organic matter. They use (aerobic) respiration and so use up oxygen from the water.</li> <li>• The water becomes deoxygenated and fish and other oxygen requiring species die.</li> <li>• Anaerobic bacteria may start to reduce nitrates (denitrification)</li> </ul> <p><b>Other impacts of fish farming</b></p> <ul style="list-style-type: none"> <li>• The farmed fish tend to be packed tightly into a small area.</li> <li>• This can lead to diseases passing through the population quickly and these can spread to the local wild fish population.</li> <li>• To keep the stock healthy antibiotics are used. This can lead to antibiotic resistant bacteria developing.</li> <li>• Pesticides used to kill the parasites may also be toxic to some of the local marine invertebrates.</li> <li>• Farmed fish may have a selective advantage over wild species</li> </ul> <p><b>Methods of preventing overfishing</b></p> <ul style="list-style-type: none"> <li>• Net mesh sizes may be restricted. Larger mesh sizes allow immature fish to escape and they can go on to interbreed.</li> <li>• Closed seasons for fishing are also enforced. These will be at times of the year when fish are breeding so again the stocks are replenished.</li> <li>• Quotas - agreements which limit the catches brought ashore.</li> <li>• Around the coast there are exclusion zones where fishing is not allowed. These areas allow fish to reproduce without being caught.</li> <li>• Landing size regulations have been introduced which only allowing fish of a certain size to be caught. This allows some fish to return for breeding. Fishing of non-traditional varieties e.g. coalfish, has allowed stocks of other fish to recover.</li> </ul>	5	4		9		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths *	Prac **
				<p><b>7-9 marks</b> Detailed explanation of eutrophication <b>and</b> Detailed explanation of other impacts of fish farming <b>and</b> Detailed explanation of methods of preventing overfishing <i>The candidate constructs an articulate, integrated account, 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.</i></p> <p><b>4-6 marks</b> Any two from Explanation of eutrophication Explanation of other impacts of fish farming Explanation of methods of preventing overfishing <i>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.</i></p> <p><b>1-3 marks</b> Brief explanation of eutrophication <b>or</b> Brief explanation of other impacts of fish farming <b>or</b> Brief explanation of methods of preventing overfishing <i>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.</i></p> <p><b>0 marks</b> <i>The candidate does not make any attempt or give a relevant answer worthy of credit</i></p>						
				<b>Question 7 total</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>0</b>

## SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	3	5	10	0	0
2	4	7	0	11	2	0
3	1	9	5	15	0	2
4	3	4	0	7	3	0
5	0	8	10	18	4	10
6	9	5	6	20	0	3
7	5	4	0	9	0	0
<b>Total</b>	<b>24</b>	<b>40</b>	<b>26</b>	<b>90</b>	<b>9</b>	<b>15</b>

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