



GCE MARKING SCHEME

SUMMER 2016

**HUMAN BIOLOGY - HB4
1074/02**

INTRODUCTION

This marking scheme was used by WJEC for the 2016 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.

Question			Marking details	Marks Available
1	(a)	(i)	Rhizobium/ Azotobacter;	1
		(ii)	active transport;	1
		(iii)	Nitrification;	1
	(b)	Drainage / ploughing + aeration of soil encourage nitrogen fixing bacteria / prevent denitrification;	3	
		Planting leguminous crops + Rhizobium, root nodules, fix nitrogen.		
		Add manure + Decomposition / putrefaction by bacteria and fungi;		
		Question 1 total		[6]

Question		Marking details	Marks Available
2	(a)	Myofibrils; Actin; Quaternary; Primary; Accept tertiary Mitosis;	5
	(b)	(i) D; A;	2
		(ii) Decrease in slow type 1 fibres; Fast type 2a slightly higher than average active person; Fast type 2x much higher;	3
	(c)	Resistance training for first three months + reduces fast 2x fibres; No resistance training for next 3 months leading to competition which increases the fast 2x fibres; The numbers of 2x fibres reach a peak 3 months {after the end of resistance training/ at the time of the race};	3
		Question 2 total	[13]

Question			Marking details	Marks Available
3	(a)	(i)	A = Myelin sheath / Schwann cell B = Presynaptic membrane. C = Synaptic cleft D = Mitochondrion. 2 correct 1 mark.	2
		(ii)	Cl ⁻ ions enter {resting potential falls/ potential difference would be more negative/ hyperpolarisation}; K ⁺ ions leave {resting potential falls/ potential difference would be more negative/ hyperpolarisation}; Threshold potential not reached; Sodium voltage gated channels in postsynaptic membrane remain closed; No {depolarisation/ action potential};	Max 4
	(b)	Unidirectional; Amplification/ summation; Adaptation / accommodation/ filter; Integration/ Co- ordination; Transmits impulse from one neurone to another;	Max 2	
	(c)	(i)	water used to break bond; (hydrolyse) between the acetyl group and choline / ethanoic acid + choline; lowers activation energy / ref. active site complementary shape;	2
		(ii)	Acetylcholine remains bound to post synaptic receptors; {Motor end plate/sarcolemma} remains depolarised/ action potential would continue to be produced; Muscle remains contracted	Max 2
Question 3 Total				[12]

Question		Marking details	Marks Available
4	(a)	Q and S; V; W; T, W; W; U(V);	6
	(b)	(i) $\frac{300 \times 0.1}{4}$ = 7.5 dm ³ hour ⁻¹ ; 7.5 x 24 = 180dm ³ per day; 1 mark for 1 st part of calculation	2
		(ii) 180/3 = 60; ecf from i	1
	(c)	(i) Osmosis;	1
		(ii) water absorbed as the filtrate passes down PCT; therefore increasing the Concentration of DDT producing a higher concentration gradient	2
		(iii) increases;	1
		(iv) Limited number of Carrier proteins; They become saturated;	2
Question 4 Total			[15]

Question		Marking details	Marks Available
5	(a)	Light (energy) into chemical (energy);	1
	(b)	(i) Convert carbon dioxide into a {form of carbon which can be used by living organisms/ organic molecules};	1
		(ii) Combine CO ₂ with RUBP; (With the use of) RUBISCO; To form an unstable 6 carbon molecule / breaks down into 2 x GP;	3
	(c)	Organic, Glucose/ triose phosphate Accept ATP; Inorganic oxygen;	2
		Question 5 Total	[7]

Question		Marking details			Marks Available													
6	(a)	(i)	2 correct arrows CO ₂ -arrows after citrate and ketoglutarate; 4 correct arrows hydrogen 2 marks.			3												
		(ii)	FAD			1												
	(b)	(i)	ATP used to phosphorylate / provide activation energy glucose;			1												
		(ii)	<table border="1"> <thead> <tr> <th>Stage of respiration</th> <th>Number of ATP molecules made by substrate level phosphorylation</th> <th>Number of ATP molecules indirectly made by oxidative phosphorylation</th> </tr> </thead> <tbody> <tr> <td>Glycolysis</td> <td>4</td> <td>6</td> </tr> <tr> <td>Link reaction</td> <td>0</td> <td>6</td> </tr> <tr> <td>Krebs cycle</td> <td>2</td> <td>22</td> </tr> </tbody> </table>			Stage of respiration	Number of ATP molecules made by substrate level phosphorylation	Number of ATP molecules indirectly made by oxidative phosphorylation	Glycolysis	4	6	Link reaction	0	6	Krebs cycle	2	22	4
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		Glycolysis	4	6														
		Link reaction	0	6														
	Krebs cycle	2	22															
	(iii)	Lost as heat;			1													
	(iv)	Reduced proton gradient; No ATP produced by ATP synthetase; More glucose broken down by respiration; Fat used as respiratory substrate / less food material stored; Respiration faster / energy not used to make ATP , more heat produced; Active transport;			5													
(c)	If all NAD is in reduced form from ethanol breakdown; Krebs cycle slows and fatty acids accumulate / fats accumulate + NAD required for Krebs cycle to continue;			2														
Question 6 Total					[17]													

Question		Marking details	Marks Available
7	(a)	<p>A Lag phase human much longer than bacteria;</p> <p>B Bacteria reproducing asexually, humans sexually;</p> <p>C Humans longer period to become sexually mature/Delay in finding mate/ Humans long gestation period;</p> <p>D Graph drawn for bacteria. Correct shape with both axes labelled with population size and time, units must be appropriate.</p> <p>E Graph drawn for human. Correct shape with both axes labelled with population size and time, units must be appropriate.</p> <p>F Idea of time correct on both</p> <p>G Log phase much steeper in bacteria;</p> <p>H Bacteria reach stationary phase - environmental pressure / limiting factors / rate of reproduction = death rate , humans not yet;</p> <p>I Bacterial populations death phase, death rate exceeds rate of reproduction, humans not yet;</p> <p>J Correctly explained carrying capacity (not just a labelled line on a graph) as max numbers of a population that can be sustained by the environment.</p> <p>K Bacteria, stationary phase and death phase lack of nutrients but humans control food production;</p> <p>L Accumulation of waste products bacteria, Humans exert some control over accumulation of toxic waste/ Humans are able to control disease / predation;</p> <p>M Correct use of how density dependent and density independent factors affect population size</p> <p>N Humans can effect population increase by contraception or war.</p> <p>O Effect of antibiotics/ infectious disease control;</p> <p>Question 7 a Total</p>	<p>[10]</p> <p>[10]</p>

Question		Marking details	Marks Available
7	(b)	<p>A CVA caused by rupture of blood vessel in brain;</p> <p>B blockage of blood vessel in the brain;</p> <p>C Surgery to clamp broken vessels / bypass;</p> <p>D Clot busting drugs;</p> <p>E Stent to open blood vessels;</p> <p>F Reduce blood pressure / reduce risk of rupture of blood vessel + damage to endothelium/</p> <p>G Diet low in sodium levels;</p> <p>H Healthy weight / Active;</p> <p>I Reduce saturated fat / cholesterol in diet, reduce risk atheroma;</p> <p>J Stop smoking, reduce damage to blood vessels;</p> <p>K Parkinson's - cells in part of brain dying, death of cells producing dopamine</p> <p>L Dopamine helps to control motor activity / regulate movement;</p> <p>M Motor neurone disease, degeneration motor neurones</p> <p>N Neither affected by lifestyle/ some environmental factors could influence onset of Parkinson's eg.pesticides/ organophosphates ;</p> <p>O AVP;</p> <p>Question 7 b Total</p>	<p>[10]</p> <p>[10]</p>