GCE AS MARKING SCHEME

SUMMER 2017

AS (NEW)
BIOLOGY - COMPONENT 1
B400U10-1

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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.

COMPONENT 1 – Basic Biochemistry and Cell Organisation

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

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		triglyceride (1) **Any 2 from:** • protection of vital organs (1) • {thermal/ electrical} insulation (1) NOT prevent heat loss • energy {storage / source}(1) NOT energy release • metabolic water (1) • buoyancy (1) • waterproofing (1)	3			3		
		(ii)		mix sample thoroughly with ethanol (and water) (1) emulsion (test) / goes {cloudy/ milky}(1) Accept details of alternative tests, e.g. Sudan III - goes red, brown paper test - translucent	2			2		2
		(iii)		• X is saturated but {Y and Z are unsaturated / Y monounsaturated + Z polyunsaturated} (1) • unsaturated fats decrease level of {LDL / low density lipoprotein} / cholesterol/ ORA/ unsaturated fats increase level of HDL (1) • reduces risk of{ heart disease / atherosclerosis/ atheroma formation/ description of atheroma formation}/ ORA (1)	1	1 1		3		
	(b)	(i)		• {phosphate/ head} is {hydrophilic/ polar} so attracted to water/ owtte (1) • {fatty acids/ tails} are {hydrophic/ non-polar} so repelled from water/ owtte (1) Accept heads are hydrophilic, tails are hydrophobic (with no explanation)	2			2		
		(ii)		140 x 2 = 280μm^2		1		1	1	
		(iii)		phospholipids arranged in <u>bilayer</u> in cell membrane (but in a single layer on water)		1		1		

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(c)			• ref to fluid mosaic model (1) • proteins can {move / diffuse} within membrane / proteins are arranged randomly(1) • {Fluorescence restored in the area exposed to the laser after 5 minutes / {Other/ non affected} proteins can move into the area exposed to the laser after 5 minutes (1) (must in context of protein movement)	1	1 1		3		
				Question 1 total	**9**	**6**	**0**	**15**	**1**	**2**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		domain = eukaryote/ eukarya (1) kingdoms: human = Animal(ia) **and** yeast = fungi (1) human has no cell wall **and** yeast has <u>chitin</u> cell wall (1)	 1 1	1		3		
		(ii)		Correct answer= 12000/ 12005/ 12009= 2 marks Accept answers which would round to the above If incorrect, accept either of following for 1 mark • Use of scale bar [(12 x 1000)/1] • width of image/ length of scale bar [110/12 = 9.16] • height of image/ [length of scale bar [91/12=7.58] Accept measurements of either cell divided by 12/1.2 (must be matching units)		2		2	2	
		(iii)	I	digestion will be internal / intracellular (1)	1			1		
			II	Golgi body {processes/ produces/modifies} enzymes/ {packages into/ produces} lysosomes (1) lysosomes <u>fuse</u> with phagocytic vesicle and release enzymes (1)		 1 1		2		
	(b)	(i)		molecule of {nucleic acid / DNA / RNA} surrounded by a {protein coat / capsid} (1) (acellular as) {does not have membranes/ no organelles/ cell membranes/ cytoplasm} (1) Accept labelled diagram	1	 1		2		
		(ii)		= 0.13µm / 1.3 x 10^2 nm/ 130 nm = 3 marks = 1.3 x 10^{-4}mm/ 0.00013mm/ 1.3 x 10^{-7}m/ 0.00000013m = 2 marks (inappropriate units for virus) 0.133333...µm/ 1.333333 x 10^2 nm = 2 marks (not 2 sig fig) 18 x 1000 / 135000 = 1 mark for calculation Deduct one mark for missing units/ wrong units		3		3	3	
				Question 2 total	**4**	**9**	**0**	**13**	**5**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			A = chromatid (1) ignore sister / daughter reject chromosome B = centromere (1)	2			2		
	(b)	(i)		crossing over / synapsis / chiasmata formation (1) reject chiasmata are exchanged/ crossed over in Prophase I (of meiosis) (1)	2			2		
		(ii)		**Any two (x1) from:** • {two (cell) divisions/ two named phases I and II} (producing four cells) (1) • crossing over/ independent assortment/ or description of(1) • Only one chromatid from each pair of chromosomes in each daughter cell	2			2		
		(iii)		{more difficult for/ less likely that/ more rare that/ lower probability that} crossing over to take place (1) because Y chromosome shorter than X chromosome/OWTTE (1)	1		1	2		
				Question 3 total	**7**	**0**	**1**	**8**	**0**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Staining/ add a dye/ add correct named dye	1			1		1
	(b)			**Prophase** B **Metaphase** C **and** E **Anaphase** F **Telophase** A **and** D 6 correct answers = 3 marks 4/5 correct answers = 2 marks 2/3 correct answers = 1 mark 0/1 correct answers = 0 marks	3			3		3
	(c)	(i)		12.8 = 2 marks If incorrect 1 mark only for any of: • 6/47 x 100 • 12.76 • rounded to 12.7 • 13.0 NOT 13		2		2	2	
		(ii)		**Answer must be comparative** higher mitotic index closer to the tip/ORA (1) {higher rate of growth/higher rate of cell division/ shorter cell cycle/ mitosis takes place more rapidly/ more cells undergoing mitosis} / ORA (1)		2		2		
		(iii)		{Repeat/ increase sample} **and** calculate a mean (1) Accept average		1		1		1

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			**Any four (x1) from:** **A.** mitotic index only gives information about cell division OR mitotic index does not take into account cell {length/ size} (1) **B.** cells increase in size during growth/ OR (cell) growth can also be measured by cell {size/ length} OR {cells get longer/ bigger} when they grow (1) **C.** {cells are {longer/ bigger} {further from root tip/ at 1.8mm} OR cells are {shorter/ smaller} {closer to the root tip/ at 0.2mm} OR more {mitosis/ cell division} {at/ closer to} root tip OR less {mitosis/ cell division} further from root tip} (1) **D.** Growth is a combination of cell division **and** increase in size (1) **E.** Use of data (1)			4	4		
	(e)			**Any three (x1) from:** • cells may be damaged/ broken(1) NOT squashed • not stained enough (to see chromosomes)/ chromosomes not visible/ blurred image/ poor resolution (1) • layers of cells overlap (1) • {non-random selection of /lack of consistency in how part cells are included in} fields of view (1)			3	3		3
				Question 4 total	**4**	**5**	**7**	**16**	**2**	**8**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		{insertion/ addition} of <u>water</u> to break a <u>bond</u> NOT hydrogen	1			1		
		(ii)		breaks (bonds) in the {middle/ inside} of {a molecule / DNA}		1		1		
		(iii)		AGA¦TA¦TGGA¦CG¦TAA (1) bonds broken on 5' side of each nucleotide with a pyrimidine (1) C and T are pyrimidines (1) Accept on diagram		1 1 1		 3		
	(b)	(i)		Accept range 1.32 – 1.38 accept rounding to 1d.p.		1		1	1	
		(ii)		higher initial rate as {substrate/ DNA} is at {maximum/ higher} concentration (1) (therefore) higher rate of collisions/ more ES complexes formed/ owtte(1) Accept reverse argument / explanation for 0.5 minutes	2			2		
		(iii)		temperature **and** pH (1) **Any 2 from:** • change in temperature changes kinetic energy and therefore changes {rate of reaction/ number of successful collisions} (1) • changes to pH {changes 3D structure of active site/ results in less enzyme substrate complexes/ successful collisions/ enzyme substrate complexes} (1) • extremes of temperature/ pH cause denaturation (1)		1 1 1		 3		3
	(c)			**Any three (x1) from:** • DNA used in experiments was **synthetic** + DNase may not be effective against human DNA (1) • (DNA used in experiments) was **single stranded** + DNA from dead cells double stranded (1) • not tested on live {human cells / target organ}/ valid comment on experimental vs live conditions (1) • could damage (healthy) cells/ could cause side effects (1)			3	3		
				Question 5 total	**3**	**8**	**3**	**14**	**1**	**3**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content** **Primary, secondary, tertiary, quaternary structure** • primary – sequence of amino acids held by peptide bonds • secondary – coiling/ folding of polypeptide chain held by hydrogen bonds • tertiary – further folding of secondary structures due to R group interactions/ ionic/ covalent/ S-S/ hydrogen bonds/ hydrophobic interactions • quaternary – more than one polypeptide chain held together **Effect of changes on levels of protein structure** • primary protein structure changed due to amino acid sequences of both A and B chains are different • secondary structure could change how the α helices in A and B chains would form • tertiary structure would change as different amino acids would change R/ variable groups bonding between different parts of polypeptide chains e,g, Changing aa 1 and 19 of chain A could result in additional / different disulphide bridges forming • Quaternary structure Changing Cys to Gly (aa B chain 19) and Cys to Tyr (aa A chain 7) mean that disulphide bridges may not form between the A and B chains. **Effect on Functionality** • Insulin must be able to bind to receptors so must have a specific shape • Any change to 3D shape of the insulin molecule could affect how it binds to receptor molecules • {prevent/ reduce abiity of} cells to absorb glucose from the plasma.		5	4	9		

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Indicative content of this level is: Detailed explanation of levels of protein structure **and** Detailed explanation of effects of change on protein structure **and** Detailed explanation of the effect of functionality *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*. **4-6 marks** Indicative content of this level is: **Any two from:** Explanation of levels of protein structure Explanation of effects of change on protein structure Explanation of the effect of functionality *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** Indicative content of this level is: Brief explanation of levels of protein structure **OR** Brief explanation of effects of change on protein structure **OR** Brief explanation of the effect of functionality *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.*						
				Question 6 total		**5**	**4**	**9**		

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COMPONENT 1 – AS BIOLOGY EDUQAS 2017

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Q	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	**9**	**6**	**0**	**15**	**1**	**2**
2	**4**	**9**	**0**	**13**	**5**	**0**
3	**7**	**0**	**1**	**8**	**0**	**0**
4	**4**	**5**	**7**	**16**	**2**	**7**
5	**3**	**8**	**3**	**14**	**1**	**3**
6	**0**	**5**	**4**	**9**	**0**	**0**
TOTAL	**27**	**33**	**15**	**75**	**9**	**12**

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