GCE AS MARKING SCHEME

SUMMER 2016

BIOLOGY COMPONENT 1
B400U10-1

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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.

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EDUQAS AS BIOLOGY
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)		All **3 for 1 mark** A Phosphate + B Pentose/ 5C sugar + C nitrogenous/organic base	1			1		
		(ii)		**DNA** **A** 1 phosphate **+** **B** Deoxyribose (1) **RNA** **A** 1 phosphate **+** **B** Ribose (1) **ATP** **A** 3 phosphates **+** **B** Ribose(1)	3			3		
	(b)	(i)		**Both for 1 mark** Glucose + Galactose		1		1		
		(ii)		Both decrease/or suitable figures (when cyanide is added) (1) **+ Any one from:** • Cyanide stops active transport as {it stops ATP production/ it requires energy}/ • Other 2 sugars remain at the same level because {they do not need {ATP/ energy} to be absorbed/ } (1)		2		2		
	(c)			External concentration must be higher than internal concentration (so that sugars enter the cells)/ diffusion is the movement of molecules down a concentration gradient (1) {All the sugars show some/ there is} uptake when cyanide is present so this must be by diffusion/ diffusion is a passive process and not affected by cyanide (1)		2		2		
				Question 1 total	**4**	**5**	**0**	**9**	**0**	**0**

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Protein + {Nucleic acid/DNA/RNA} (1)	1			1		
	(b)			(Globular) protein (1) Accept Polypeptide With a carbohydrate (chain)/polysaccharide/oligosaccharide (attached to it) (1) Reject Glycogen	2			2		
	(c)			• Binding to receptor/ glycocalyx/ carbohydrate (chains)/ glycoprotein/ protein (1) • Phagocytosis / endocytosis / (macro)pinocytosis (1) • Plasma/cell membrane {encloses/ engulfs} the virus (in a vesicle) (1)	3			3		
				Question 2 total	**6**	**0**	**0**	**6**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		That they had diabetes (1) **+ Any one from:** • Because this is a reading of 0.75mg cm^3 **and** it should be 0 for a non diabetic/ • Because this is a reading of 0.75mg cm^3 **and** it is above 0.18 mg/cm^3 (1)			2	2		
		(ii)		Blood is {red/coloured} so could not get a colorimeter reading/ light cannot pass through		1		1		1
	(b)			**Any two (x1) from:** Only glucose will give a result/enzyme specific (to glucose) (1) Detects very low concentrations (1) Reading is more accurate /enzyme is more stable (1) Accept works at different temperatures	2			2		
	(c)	(i)		<u>On carbon 4</u> glucose has {the H above the ring/ OH below} in galactose it is reverse/ ORA		1		1		
		(ii)		Lactose **and** water	1			1		
				Question 3 total	**3**	**2**	**2**	**7**	**0**	**1**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		Substitution (1), calculation (1), 1dp (1) *using 3.14* (2 x 3.14 x 16) + (2 x 3.14 x 4 x 45) (100.48 + 1130.4) **=1230.9 (3 marks)** *using π from calculator* (2π x16) + (2π 4x45) (100.43 + 1130.97) **= 1231.5 (3 marks)** **2662.7** (using 3.14 and diameter) (2 marks) **2789.7** (using π and diameter) (2 marks)		3		3	3	
	(b)			• Correct axes with linear scale using at least 6 large squares (1) • Fully labelled axes (sucrose concentration /M on x axis and Percentage change in mass / % on y axis) (1) • Correct plots (1) ±½ small square		3		3	3	

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			• Figure from candidates graph where it crosses the x axis converted to kPa (1) Must have unit (normally a range between -540 and -680kPa) • {Where the line intercepts the X axis/ as the line passes 0} is where there is no change in mass. (1) • This is where the water potential of the external solution = water potential of tissue/ It is the isotonic solution/ equal water potentials (in context) (1)		2	1	3		3
	(d)			In **0.0 M** sucrose • {the external **ψ** is higher than ψ_{cell}/ OWTTE}, water moves in by osmosis (1) • So gaining mass (1) In **0.8M** sucrose • {the external **ψ** is lower than ψ_{cell}/ OWTTE}, water moves out by osmosis (1) • So decreasing the mass (1) **Osmosis only needs to be mentioned once** Reject gain/ loss of mass not linked to water movement	4			4		1

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(e)	(i)		Sweet potato has a {very high sugar concentration/ very low water potential}/ OWTTE			1	1		1
		(ii)		Increase the sucrose concentration (1) Accept use a wider range (Until a point is reached) where water will flow out of the potato (1)			2	2		2
				Question 4 total	**4**	**8**	**4**	**16**	**6**	**7**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Hydrolysis/ break down of lipids (1) Causing production of fatty acids (1) Fatty acids cause the milk to become more acidic/lower pH, (so becomes colourless) (1)	1	2		3		3
	(b)			Result depends on pH change in test tube so cannot change pH of experiment/ OWTTE e.g. acid pHs start colourless therefore cannot see change/ pH buffer would prevent changes in colour		1		1		1
	(c)			**Any 3 from:** 1. Drug is a similar shape to the substrate/ complementary to active site (1) 2. Drug {binds to/ blocks/ occupies} the active site of the {enzyme/lipase}/ the {substrate/lipid} cannot enter active site/ forms enzyme inhibitor complex (1) 3. Fewer enzyme substrate complexes/less lipid molecules are hydrolysed by the lipase/ fewer successful collisions (1)		3		3		
	(d)	(i)		Lipids are undigested/not broken down (and cannot be absorbed, so pass out of body) (1) Reduced {energy/calorie uptake} so body use{stored/ body} fat (1)		2		2		
		(ii)		**Any 1 from:** • {Continue to eat fatty food/ same diet as before} but now enzyme is not inhibited/ • so lipids now {digested/broken down/hydrolysed} **and** absorbed		1		1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(d)	(iii)		**Any 3 from:** • {More rapid / 4-5% / greater} weight loss {in first year/ initially/ at start} in drug treated/ORA (1) • No further weight loss after 1 year in drug treated / no benefit after 4 years/ORA (1) • Long term treatment could affect **health** due to the effect of diarrhoea/ deficiency diseases/ weight may be regained/ psychological effect(1) • Additional cost of drug/ have to take vitamin tablets (1)			3	3		
				Question 5 total	**1**	**9**	**3**	**13**	**0**	**4**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			• {RNA polymerase/ helicase} {unwinding/ unzips} DNA (1) • complementary RNA nucleotides base pair (or indicated with A-U, C-G) with DNA {nucleotides/ template} (1) • Correct role of RNA polymerase in joining nucleotides (1)	3			3		
	(b)	(i)		Introns do not code for the {amino acid (sequence) in / primary structure of} the protein/ only exons code for the amino acid (sequence) in the protein / OWTTE(1) if introns are included a different protein (structure) would be produced/ OWTTE (1)		2		2		
		(ii)		Intron – no effect (as not translated) (1) Exon- (may) change the {amino acid sequence/ primary structure} or there would be a different amino acid in the polypeptide chain (1)			2	2		
	(c)	(i)		**Both lines** Met – phe – gln – trp – (stop)	1			1		
		(ii)		codes for the same amino acid/ still codes for phe/ no change in protein structure		1		1		
	(d)	(i)		0.98:1 OR 1:1.02 + 2 decimal places (1) Accept 0.98 1.03:1 OR 1:0.97 + 2 decimal places (1) Accept 1.03		2		2	2	

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	d	(ii)		**Any 4 (x1) from:** **Pauling** • had 3 {helices/strands} {which is incorrect/should be 2} (1) • Which does not allow 1:1 base pairing (1) • Has the phosphates on the inside instead of the outside / correct in that sugar groups are not in the core/ has bases on the periphery rather than the centre (1) **Franklin** • Closer to modern knowledge than Pauling (1) • Correct in that DNA is a helical structure but did not determine that it contained 2 chains (1) NOT alpha helix • Correct that phosphates are on the outside(1)			4	4		
				Question 6 total	**4**	**5**	**6**	**15**	**2**	**0**

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Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7	**ESSAY**						
	A is meiosis, B is mitosis; <u>The significance of mitosis</u> • daughter cells are genetically identical; • growth; • repair/healing following damage and disease; • repeated cell renewal/continuous cell division – with e.g. such as skin/gut lining/bone marrow and R & WBC production; • maintains chromosome number; <u>The significance of meiosis</u> • produces non identical/genetically different daughter cells; • Gamete production ; • Raw material for evolution/survival of the fittest; • Some comment on advantage of sexual reproduction in the event of environmental change/disease; • Some mention of sources of variation – crossing over in prophase 1 and random assortment; • Haploid cells produced so that at fertilisation the diploid number is regained; <u>Tumour formation</u> • Reference to a genetic change in B which allows mitosis to continue in an unrestricted way. Solid mass of cells which prevent normal cells from functioning. Reference to benign/malignant. Cell division stops after meiosis;	5	4				

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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 coverage of significance of mitosis, meiosis **and** tumour formation. *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 Indicative content of this level is • Some coverage of significance of mitosis **and** meiosis. Reference to tumours may be missing/ incorrect *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.*						

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-3 marks Indicative content of this level is… • Some coverage of significance of mitosis or meiosis. *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	**5**	**4**	**0**	**9**	**0**	**0**

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COMPONENT 1: BASIC BIOCHEMISTRY AND CELL ORGANISATION

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

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

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