



---

# **GCE AS MARKING SCHEME**

---

**SUMMER 2017**

**AS (NEW)  
BIOLOGY - UNIT 1  
2400U10-1**

## **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 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

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		Cilia (1) Ignore ciliated cell {Move/ sweep/ push/ clear} mucus (1)	2			2		
		(ii)		<ul style="list-style-type: none"> <li>An organ is an aggregation of several tissues but this only shows one/</li> <li>{It/ Image 1} only contains one type of {cell/ tissue}</li> </ul> Ignore similar cells	1			1		
	(b)	(i)		Self-replication/ Stage (of division) / stage of development / size/ not fully formed/ age		1		1		
		(ii)		<b>25 x a measurement</b> 1.45/ 1.475/ 1.48/ 1.5 um = 3 marks <b>If incorrect allow (250 x a measurement) for 2 marks</b> 1450/1475/1480/1500 (nm) <b>If incorrect allow a measurement for 1 mark units must be shown</b> 58/59/60mm or 5.8/5.9/6.0 cm		3		3	3	
		(iii)		<b>Explanation must match adaptation</b> Increased/ larger surface area : volume (ratio)(1) Increased gas exchange (1)  Cylindrical (1) decreases diffusion distance / large surface area for gas exchange(1)  Folding of inner membrane/ cristae (1) {Increased/ large} SA for {enzymes/ membrane proteins / (aerobic) respiration/ / ATP production} (1) NOT energy production/ release	2			2		
				<b>Question 1 total</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>9</b>	<b>3</b>	<b>0</b>

Question		Marking details		Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		<p><b>Any three (x1) from:</b>            Temperature            Time            Rate of spin            Volume/ mass/ amount of DNA/ sample            relevant condition of tube ie {density / concentration / volume / height of/ type of } medium Not solution unqualified            3 correct = 2 marks, 2/1 correct = 1 mark, 0 correct = 0 marks</p>		2		2		2
	(b)	(i)	<p>A: <math>^{14}\text{N}</math> /light/14            B: <math>^{14}\text{N} + ^{15}\text{N}</math> /light and heavy/14 and 15            C: <math>^{15}\text{N}</math> / heavy/ 15            All correct = 1 mark</p>		1		1		1
		(ii)	<p>A. {Generation 0 /{band/peak} at C} is all {heavy isotope/ <math>\text{N}^{15}</math>} (1)            B. <b>Generation 1</b> {band/ peak} at B is {a mixture of heavy and light isotope/ an intermediate}(1)            C. Because each molecule retains one strand of heavy isotope and one strand of newly formed DNA of light isotope (1)            Accept hybrid DNA for intermediate DNA</p>	2			3		
		(iii)	<p>A. (Only) {<math>^{14}\text{N}</math> / light isotope} (nucleotides ) are available for replication (1)            B. <b>Generation 2</b> has equal {height scans/ peaks / density} (1)            C. <b>because</b> one strand of heavy and one strand of light DNA have been used as templates for the formation of new DNA molecules/ owtte (1)            D. <b>Generation 3</b> has a higher peak of {<math>^{14}\text{N}</math> / light isotope/ A} <b>because</b> more light DNA (strands) are used as template/ owtte (1)</p>		3		4		
						1			

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iv)	<p><b>Any two for 1 mark from:</b> DNA polymerase / (DNA) helicase / (DNA) ligase (1)</p> <p><b>Any two (x1) from:</b></p> <ul style="list-style-type: none"> <li>DNA polymerase – join free nucleotides (to the ends of the new DNA strand)(1)</li> <li>(DNA) helicase – {unzip/ unwind} {DNA/ helix} / breaks H-bonds {between nucleotides/ within the double strand/ between the bases} / separate (DNA) strands (1)</li> <li>(DNA) ligase – joins fragment of DNA to an existing fragment(1)</li> </ul>	3			3		
			<b>Question 2 total</b>	<b>5</b>	<b>7</b>	<b>1</b>	<b>13</b>	<b>0</b>	<b>3</b>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Pentose/ 5C (sugar) + phosphate (group) + nitrogenous / organic base NOT named base	1			1		
		(ii)		{All reactions/ source of energy} in all {cells/ organisms/ living things} NOT energy produced	1			1		
		(iii)		Exergonic (1) {Energy/ 30.6kJ mol} {released/ given out} (1) NOT produced	2			2		
	(b)			0.01 % = 2 marks Allow correct conversion of units for one mark 5 / 1000 OR 50 x 1000 (1)		2		2	2	
	(c)			A: exercise / contracting <b>and</b> B: relaxing/ at rest (1)  At rest: CP is created to be a store of phosphate (1) During exercise ATP can be generated quickly (1) (When) phosphate group from CP is given to ADP/ is used to make ATP(1)		1	3	4		
				<b>Question 3 total</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>10</b>	<b>2</b>	<b>0</b>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		Intracellular	1			1		
	(b)	(i)	<i>Independent:</i> temperature (1) <i>Dependent:</i> time (taken) to reach zero absorbance (1)	2			2		2
		(ii)	Acclimatisation/ owtte reject stated temperature		1		1		1
		(iii)	A. {Colour change/ indicator} is dependent on a change in pH (1) B. (Hydrolysis produces) fatty acids {that lower the pH/ make it acid} (1) C. Buffer solution would {stabilise/ maintain/ control} pH (to pH10/ alkaline conditions) / 'mop-up' H <sup>+</sup> (1)		3		3		3



Question		Marking details	Marks available					
			AO1	AO2	AO3	Total	Maths	Prac
(c)	(i)	<p><b>Using 18 seconds</b>  <math>2.78 \times 10^{-2} / 2.8 \times 10^{-2} / 2.63 \times 10^{-2} / 2.6 \times 10^{-2} = 3</math> marks  <math>0.02777777777777778 / 0.028 / 0.02631579 / 0.03 = 2</math> marks (not standard form)  <math>2.7 \times 10^{-2} = 2</math> marks (incorrectly rounded)  <math>2.78 \times 10^{-1} / 2.63 \times 10^{-1} = 2</math> marks (incorrect conversion)</p> <p><b>Using 19 seconds</b>  <math>2.63 \times 10^{-2} / 2.6 \times 10^{-2} = 3</math> marks  <math>0.027 = 1</math> mark (not standard form and incorrect rounding)</p> <p><b>NOT taking volume into account</b>  <b>Using 18 seconds</b>  <math>1.39 \times 10^{-2} / 1.4 \times 10^{-2} = 2</math> marks  <math>1.38 \times 10^{-2} = 1</math> mark (incorrectly rounded)  <math>0.0139 / 0.014 = 1</math> mark ( not taking standard form into account )  <math>1.3 \times 10^{-2} = 1</math> mark (incorrectly rounded)  <b>Using 19 seconds</b>  <math>1.32 \times 10^{-2} / 1.3 \times 10^{-2} = 2</math> marks  <math>0.0132 / 0.013 = 1</math> mark (not taking standard form into account)  <math>1.31 \times 10^{-2} = 1</math> mark (incorrect rounding)</p> <p><b>OR</b>  Allow <math>2 \times 0.25 = 0.5</math> for 1 mark</p>		3		3	3	
	(ii)	Cooling in the colorimeter/ Accuracy of equipment used to measure volumes/ not all volumes transferred (1)			1	1		1

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iii)	<p>A. Inappropriate (temperature) range (1)</p> <p>B. {time taken/ graph} {is still decreasing/ has not levelled off}/ all enzymes still active (1)</p> <p><i>Improvement :</i></p> <p>C. Needs to test increase temperatures above 50°C, (to determine how well the enzyme is able to work at higher temperatures) (1) ignore any temperatures below 50°C</p> <p>D. smaller increments (to determine the optimum accurately) (1)</p>			4	4		4
			<b>Question 4 total</b>	<b>3</b>	<b>7</b>	<b>5</b>	<b>15</b>	<b>3</b>	<b>11</b>

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		<p><b>Any 4 (x1) from:</b></p> <p>Similarities:</p> <p>A. Have phospholipid bilayer/ hydrophobic tails &amp; hydrophilic heads (1)</p> <p>B. Correct location of heads and tails: (hydrophobic tails) inside &amp; (hydrophilic heads) outside (1)</p> <p>C. Have protein (1)</p> <p>Differences:</p> <p>D. {Proteins not embedded in the lipid bilayer / proteins coat outer surface / continuous layer of protein / no intrinsic proteins} in Davson Danielli model (1)</p> <p>E. Ref to absence of {glycocalyx/ glycoproteins/ glycolipids/ cholesterol} in Davson Danielli model (1)</p> <p>Accept reverse for Fluid Mosaic</p>		4		4		
	(b)	(i)	<p>A. As the number of carbon atoms in the chain increases, the (transition) temperature increases (1) Accept increased chain length</p> <p>B. Because the longer the chain length the greater the intermolecular forces (1) Accept increased number of C atoms</p> <p>C. Therefore more energy needed to break the {bonds / overcome the intermolecular forces}(1)</p> <p>Accept reverse argument</p>			3	3		

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	Unsaturated contain {double bonds between carbons/ C=C}(1)  <b>Any 3 (x1) from:</b> <ul style="list-style-type: none"> <li>• Produces a kink / bend, in the side chain (1)</li> <li>• Less packing is possible/ increased distance between the chains (1)</li> <li>• Lowers intermolecular force /(phase) transition temperature (1)</li> <li>• less energy needed {to break the bonds/ overcome the intermolecular forces} (1)</li> </ul>	1		3	4		
		(iii)	Between the {fatty acids / hydrophobic tails} Accept labelled diagram		1		1		
		(iv)	Raises level of LDLs/ causes LDLs to be made (1) Increase incidence of atheroma in arteries/ detailed description of atheroma (1)	2			2		
			<b>Question 5 total</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>14</b>	<b>0</b>	<b>0</b>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			Magnesium - chlorophyll (1) NOT chloroplast Calcium – (structure of) cell <u>walls</u> in plants (1) Phosphate - nucleic acids/ nucleotides/ phospholipids/ ATP/ NADP/ NAD/ FAD(1)	3			3		
	(b)	(i)		Active transport (1) Against concentration gradient (1) Correct use of data (1)	1	2		3		
		(ii)		A. anaerobic conditions / lack of oxygen/ oxygen is required(1) B. {Less/ no} ATP produced (1) C. active transport {cannot occur/ reduced}, fewer ions can be transported (against concentration gradient) (1) D. Stunted growth because of a lack of named ion {e.g. phosphate, required to make DNA and proteins essential for growth} (1)		3		4		
				<b>Question 6 total</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>10</b>	<b>0</b>	<b>0</b>

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7	<p>Indicative content:</p> <p>A: Cell division</p> <ul style="list-style-type: none"> <li>• Mitosis</li> <li>• DNA mass doubles, then halves/ returns to same content</li> <li>• one cell cycle is within 24 hours</li> </ul> <p>B: DNA mass</p> <ul style="list-style-type: none"> <li>• DNA replication occurs during interphase</li> <li>• Causing DNA to double</li> <li>• After interphase DNA mass remains constant</li> <li>• After interphase DNA present as chromosomes/ 2 chromatids</li> <li>• Mass DNA halves at telophase/ cytokinesis</li> <li>• when nuclear membrane reforms</li> </ul> <p>C: Cell mass</p> <ul style="list-style-type: none"> <li>• Interphase: mass of cell increases</li> <li>• As does cell size</li> <li>• Mass of cell continues to increase</li> <li>• due to replication of DNA / organelles</li> <li>• and possibly due to formation of spindle fibres</li> <li>• cell undergoes cytokinesis and mass of cell halves</li> </ul>	4	5	0	9	0	0

			<p><b>7-9 marks</b> Indicative content of this level</p> <p>Correct identification of mitosis with explanation Detailed explanation of changes in DNA mass Detailed explanation of changes in cell mass</p> <p><i>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.</i></p> <p><b>4-6 marks</b> Indicative content of this level Correct identification of mitosis possibly with explanation Either explanation of changes in DNA mass Or explanation of changes in cell mass</p> <p><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> Indicative content of this level Either Correct identification of mitosis possibly with explanation or brief explanation of changes in DNA mass Or Brief explanation of changes in cell mass</p>						
--	--	--	--	--	--	--	--	--	--

			<p><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 6 total</b>	<b>4</b>	<b>5</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>0</b>



**Unit 1: BASIC BIOCHEMISTRY AND CELL ORGANISATION**  
**SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

<b>Question</b>	<b>AO1</b>	<b>AO2</b>	<b>AO3</b>	<b>TOTAL MARK</b>	<b>MATHS</b>	<b>PRAC</b>
<b>1</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>9</b>	<b>3</b>	<b>0</b>
<b>2</b>	<b>5</b>	<b>7</b>	<b>1</b>	<b>13</b>	<b>0</b>	<b>3</b>
<b>3</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>10</b>	<b>2</b>	<b>0</b>
<b>4</b>	<b>3</b>	<b>7</b>	<b>5</b>	<b>15</b>	<b>3</b>	<b>11</b>
<b>5</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>14</b>	<b>0</b>	<b>0</b>
<b>6</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>10</b>	<b>0</b>	<b>0</b>
<b>7</b>	<b>4</b>	<b>5</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>0</b>
<b>TOTAL</b>	<b>28</b>	<b>36</b>	<b>16</b>	<b>80</b>	<b>8</b>	<b>12</b>