GCE AS MARKING SCHEME

SUMMER 2024

AS
BIOLOGY - UNIT 1
2400U10-1

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCE AS BIOLOGY

UNIT 1 – BASIC BIOCHEMISTRY AND CELL ORGANISATION

SUMMER 2024 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

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td></td><td>{tRNA / transfer RNA / transfer} NOT transport RNA
and
{rRNA / ribosomal RNA / ribosomal} (1)</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td><table><tr><td></td><td>Bacterial cell</td><td>Animal cell</td></tr><tr><td>Location(s) of ribosome involved in translation</td><td>Cytoplasm</td><td>rough endoplasmic reticulum (and cytoplasm)</td></tr><tr><td>Size of ribosomes</td><td>70S / small(er)</td><td>80S/ large(r)</td></tr></table>2 marks for 4 correct boxes
1 mark for 2 or 3 correct boxes
0 marks for 1 correct boxes</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>{Animal cell / it} {is larger / has a larger surface) (than bacterial cell) (1)
{Animal cell / it} contains {membrane bound / named} organelles, (bacterial cell doesn’t) / ORA (1)</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td></td><td>A Phospholipids, + B (intrinsic / channel / carrier / transmembrane) Proteins (1)
A physical barrier / {diffusion / transport} of {small / non-polar / owtte / or example} molecules (1)
B
facilitated diffusion / active transport / transport of {large / polar molecules/ions / owtte / or example} (1)
If label incorrectly can still access function marks if they match the structure given
For mark point 2 and 3 allow named examples of substances moved</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)	I	no need for {recognition / receptor / or description of}			1	1		
			II	**Any one (x1) from** More {facilitated diffusion / active transport / or description of} (1) transport of ATP (1) attachment of enzymes (1) Accept reference to presence of {proton pumps/ ATP synth(et)ase}			1	1		
				Question 1 total	**6**	**2**	**2**	**10**		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		{organic **/** nitrogenous} base **and** {pentose / 5C sugar} **and** {phosphate / PO_4^{3-} / Pi }	1			1		
		(ii)		Structural Difference ATP has 3 phosphate, RNA has one / ATP has more phosphates / Reference to different bases in ATP and RNA nucleotide or example of (1) RNA has ribose, DNA has dexoxyribose / Less oxygen in DNA nucleotide or description of} / ORA / RNA has {uracil/H} **and** DNA has {thymine/CH_3} (1)	2			2		
		(iii)		{Phosphate/ PO_4^{3-}/ Pi} and {nitrate/NO_3^-}	1			1		
	(b)	(i)		76.9% (2) If incorrect award 1 mark for: 76.923 2 x10^{-11} /2.6 x10^{-11} x100 (1)		2		2	2	
		(ii)		**Any one (x1) from** Reference to: {protein synthesis / transcription / translation} is taking place / or description of (1) RNA is temporary (1) cell may have more or less ribosomes / OWTTE (1)		1		1		
	(c)			Energy is released when ATP is {hydrolysed / broken down} (to ADP and Pi) / or description of (1) {Energy is stored / ATP is made} when ADP and {phosphate / Pi} are joined / or description of / ADP + Pi → ATP (1) It is the source of energy in all {cells / reactions} in all organisms (1)	1	2		3		
				Question 2 total	**5**	**5**	**0**	**10**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Catalase {lowers the activation energy / lowers the energy needed for the reaction / provides a pathway of lower energy} (1) **Any one (x1) from** • Important in living cells to {increase rate of breakdown of hydrogen peroxide at {physiological / body} temperature / reactions would be too slow at body temperature (1) • Without this process hydrogen peroxide would {kill the cell / build up / be toxic to the organism} (1)	1	1		2		
	(b)	(i)		0.9 = 2 marks Award 1 mark for 0.86666667 26/30		2		2	2	2
		(ii)		labels: x axis = concentration of hydrogen peroxide / vol + y axis = rate of oxygen production / $cm^3\ s^{-1}$ (1) linear scales + use of at least half the graph paper (1) plots correct +/- less than one small square (1) suitable line drawn including 0 (1)		4		4	4	4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		• As the <u>concentration</u> of hydrogen peroxide increases, the rate (of oxygen production) increases **and** then levels off (1) • At lower concentrations the {hydrogen peroxide / substrate} concentration is the limiting factor / increasing concentration results in {more enzyme- substrate complexes / increased chance of successful collisions} (1) • At the higher concentrations {catalase concentration / enzyme concentration/ number of active sites} is the limiting factor / • At higher concentrations all the active sites on the catalase are full (1)	1	2		3		3
		(iv)		**Any two (x1) from** • Repeat experiment to {improve repeatability / reliability / to calculate a reliable mean}. (1) • Carry out the experiment with {more / different} concentrations (of hydrogen peroxide) / owtte (1) • Suggestion of a more accurate way of <u>measuring volume</u> (of oxygen), eg, a gas syringe / a burette. (1) • Control temperature using a thermostatically controlled water bath (1) • Control pH using a buffer (1)			2	2		2
		(v)		Similar shape graph but <u>plateau at a lower Vmax.</u> (1)		1		1		
				Question 3 total	**2**	**10**	**2**	**14**	**6**	**11**

<table>
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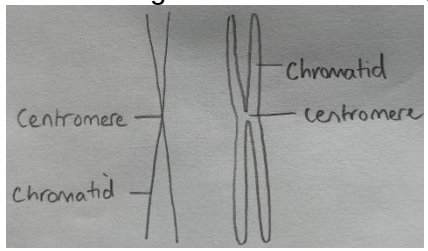
<tr><td>4</td><td>(a)</td><td>(i)</td><td></td><td>Molecules with the same {molecular / chemical} formula, but different {arrangement of atoms / structure / structural formula} (1)</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>
<table>
<tr><td>A</td><td>B</td></tr>
<tr><td>starch/ amylose/ amylopectin</td><td>cellulose</td></tr>
<tr><td>α- glucose</td><td>β – glucose</td></tr>
<tr><td colspan="2">All four boxes above correct = 2 marks
2/3 boxes correct = 1 mark
0/1 box correct = 0 marks</td></tr>
<tr><td>1-4 glycosidic bonds / {helical / spiral / compact} structure (1)
Ignore reference to branching</td><td>each {monomer / glucose} flipped by 180° (with respect to previous one) /
straight chains /
reference to {hydrogen bonds between adjacent chains / microfibrils} /
1-4 glycosidic bonds (1)</td></tr>
<tr><td>{Carbohydrate / glucose} store (1)</td><td>cell wall / structural / rigidity / strength (1)</td></tr>
</table>
</td><td>4</td><td>2</td><td></td><td>6</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>Hydrolysis is {chemical insertion / addition} of water to break the bond (1)
Maltose (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
</table>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)			**Any one (x1) from** • Both have a glycosidic bond (1) • Made of (two) glucose (monomers) (1) **Any two (x1) from** • In {maltose / 4.3} monomers are joined by an (α-)1,4 (glycosidic bond), in {gentiobiose / 4.4} they are joined by a (β-)1,6 (glycosidic bond). • {maltose / 4.3} – α glucose, {gentiobiose / 4.4} β glucose • {Maltose / 4.3} – OH group on carbon 1 points down **and** {gentiobiose / 4.4} β glucose OH group on carbon 1 points up / owtte		3		3		
	(c)	(i)		Correct annotation showing oxygen as $\delta -$ and hydrogen as $\delta +$ on any of the water molecules (1) NOT - /+	1			1		
		(ii)		{O-H / hydroxyl / polar} (groups) will form <u>hydrogen</u> bonds with water (molecules) (1)			1	1		
		(iii)		for transport / or description of (1) between {cells / tissues/ named tissues e.g. phloem} / through plasmodesmata (1)	2			2		
				Question 4 total	**10**	**5**	**1**	**16**		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		Three genes(1) **Any two (x1) from:** There are three genes present (1) (proteins in) glycoprotein (1) capsid (is made from protein) (1) reverse transcriptase (is an enzyme made of protein) (1)			3	3		
		(ii)		**Any two (x1) from:** • It does not have any ribosomes {to translate mRNA / for protein synthesis} (1) • Does not have mitochondria to produce ATP (1) • Host cell needed to supply raw materials (e.g. free nucleotides/ amino acids) / OWTTE (1)		2		2		
	(b)	(i)		2 marks for 45 216 (if use 3.14) 45 239 (if use π on calculator) Accept any number of DPs if using π on calculator 45238.9342 (rounded correctly) **If incorrect award 1 mark** 4 x {3.14 or π} x 60^2 180864 (using 120nm as radius + 3.14) 180955.7368 (using 120nm as radius + π)		2		2	2	
		(ii)		A - endocytosis and B - exocytosis (1) A results in {membrane / surface area} being {added / increased} **and** B results in {membrane / surface area} being {lost / decreased} (1)		1	1	2		
				Question 5 total	**0**	**5**	**4**	**9**	**2**	

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Centriole / centrosome	1			1		
		(ii)	I	Metaphase (1) The {chromosomes / pairs of chromatids} are {on / lined up / aligned} in {the middle of the spindle / on the equator (of the cell)} (1)	1	1		2		
			II	Labelled diagram showing chromosome after DNA replication. With Chromatids and Centromere Correct diagram with one label (1) Correct diagram with two labels (2) 		2		2		
	(b)	(i)		Quaternary,(1) more than one polypeptide / owtte (1) 2nd mp linked to 1st mp		2		2		
		(ii)		{No/slower / decreased} increase in size / growth (1) {No/slower / decreased} spindle (formed) (1) {No/slower / decreased} mitosis / cell division would stop at {prophase / metaphase} (1)			3	3		
	(c)			**Any two (x1) from:** No {spindle / centrioles} in bacteria (1) Bacterial {genome / DNA} is circular / bacteria don't have {chromosomes / histones} (1) Bacteria have no nuclei / DNA is in the cytoplasm (1)			2	2		
				Question 6 total	**2**	**5**	**5**	**12**		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7				**General trend** A1 {At lower concentrations / or given values / dilute solutions} mass increases / ORA A2 water moves in because the {water potential of solution outside cells is higher than inside / correct ref to water potential gradient} so / ORA A3 {the line crosses the axis / value from graph} where there is no change in mass A4 {the water potential of the solution inside and outside the cells is the same / so there is no net movement of water / this is the point of incipient plasmolysis / OWTTE} A5 {At higher concentrations / or given values / concentrated solutions} mass decreases A6 water moves out because the {water potential of solution outside cells is lower than inside / correct ref to water potential gradient} so Reject reference to water concentration. **Difference between potato and sweet potato** B1 Sweet potato (cells) contain (more) sugars B2 Sweet potato (cells) have a lower water potential than potato (cells) / ORA B3 The concentration at which there is {no change / owtte} in mass is higher in sweet potato than in potato B4 ref to gain in mass being greater at {0M / lower concentrations} sucrose in sweet potato / ref. to loss in mass less in sweet potato at {1M / higher concentrations (sucrose)} B5 Correct ref to data comparing potato and sweet potato to give evidence for B3 or B4	3	4	2	9		4

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				Animal tissue C1 Animal {tissue / cells} would {decrease in mass / lose water / appear crenated} if placed in solution of lower water potential / hypertonic solution. C2 There would be no change in mass if the external solution is isotonic. C3 If the external solution has a {higher water potential / is hypotonic} compared to {tissue/cells}, water would enter the cells. C4 cells would burst. C5 no cell wall.						

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				7-9 marks Indicative content of this level is detailed content from all three areas. *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 detailed content from two areas or less detail from three areas. *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 any correct indicative content. *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	**3**	**4**	**2**	**9**		**9**

Unit 1: BASIC BIOCHEMISTRY AND CELL ORGANISATION

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	6	2	2	10	0	0
2	5	5	0	10	2	0
3	2	10	2	14	6	11
4	10	5	1	16	0	0
5	0	5	4	9	2	0
6	2	5	5	12	0	0
7	3	4	2	9	0	4
TOTAL	**28**	**36**	**16**	**80**	**10**	**15**
Target	**28**	**36**	**16**	**80**	**8**	**12**