



Higher

GCSE

Biology A Gateway

J247/03: Paper 3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. **Crossed Out Responses**

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add the annotation 'SEEN' to confirm that the work has been seen.
7. Award No Response (NR) if:
 - there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

Level of response question on this paper is **24(a)**

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Biology A:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	D	1	1.1	
2	A	1	1.1	
3	A	1	1.1	
4	A	1	1.1	
5	C	1	1.2	
6	C	1	2.2	
7	D	1	1.1	
8	A	1	1.1	
9	C	1	2.1	
10	D	1	1.1	
11	D	1	2.1	
12	C	1	2.1	
13	B	1	1.1	
14	A	1	2.1	
15	A	1	2.2	

Question			Answer	Marks	AO element	Guidance
16	(a)		Any three from: Use a (measuring) balance ✓ Measure the mass of the beetroot cube at the start of the experiment ✓ Measure the mass of the beetroot cube at the end of the experiment ✓ Reference to blotting/drying the outside of the cubes ✓	3	3 x 3.3a	ALLOW use scales ALLOW weight for mass ALLOW weight for mass IGNORE any references to measuring concentrations/volumes or making the cubes the same mass ALLOW one mark for simply measuring the mass/weight of the cubes, if no other mark scored
	(b)		Any two from: Beetroot cubes come from the same plant ✓ Volume of the solution ✓ Ensure the cubes are submerged ✓ Temperature (of the solution) ✓ Size/surface area/volume of cubes ✓ Time (in the solution) ✓ Type of sugar ✓	2	2 x 2.2	ALLOW same type/variety/species of beetroot IGNORE amount of solution/how much solution IGNORE mass of cubes

Question			Answer	Marks	AO element	Guidance
	(c)		Any three from: <i>Repeatable:</i> (The student/they should) repeat the experiment/take repeat readings ✓ <i>Reproducible:</i> Another student/person conducts the experiment ✓ Use different equipment / use a different method ✓ <i>In either section once only:</i> To see if the results are the same/similar / make sure there are no anomalies ✓	3	3 x 2.2	Maximum two marks awarded in each section ALLOW use a different beetroot IGNORE compare the results ALLOW reference to small range bars being more repeatable
	(d)		Any two from: Water moves in (to the beetroot/cubes/cells) ✓ By <u>osmosis</u> ✓ The solution/outside the beetroot has a <u>lower</u> concentration (than inside the beetroot) ORA ✓	2	2 x 2.1	DO NOT ALLOW sugar solution moves in by osmosis ALLOW sugar solution has a higher/less negative water potential (than the beetroot tissue/cells) ORA ALLOW The solution/outside the beetroot is more dilute ORA

Question			Answer	Marks	AO element	Guidance
						ALLOW correct references to concentration of water / water moving down its concentration gradient

Question			Answer	Marks	AO element	Guidance
17	(a)	(i)	Embryonic (stem cell) ✓	1	2.1	ALLOW embryo stem cells
		(ii)	Can differentiate into any type of cell ✓	1	2.1	
	(b)	(i)	46% improvement is not a cure / 46% is not a large improvement / hearing is not fully restored ✓ These results are only after 10 weeks / may not be a long-term cure / have not observed long term effects ✓ Only 18 rodents were used / not a large sample size ✓ Idea that an improvement of 46% on average means some may have less than 46% improvement ✓ Only tested on rodents / results in humans might be different ✓	3	3 x 3.2a	ALLOW answers referring to only 46% hearing restored / 46% is not very high / less than half of their hearing was regained DO NOT ALLOW only 46%/less than half have been cured/regained hearing
		(ii)	Test the procedure on more rodents / Monitor the rodents hearing for longer /	1	3.3b	

Question			Answer	Marks	AO element	Guidance
			Try a different number/more nerve cell transfers / Use different type of stem cells / Try the technique on more species/humans ✓			IGNORE reference to making deaf in two ears
	(c)		First check the answer on the answer line If answer = 1.5 award 2 marks 10 x 0.15 OR 15/100 x 10 ✓ = 1.5 ✓	2	2 x 2.2	ALLOW any correct calculating method ALLOW 1 500 000 on the answer line for one mark max

Question			Answer				Marks	AO element	Guidance
18	(a)	(i)	Aorta ✓				1	1.1	
		(ii)	Translocation ✓				1	1.1	
		(ii)	Vena cava ✓				1	1.1	
	(b)			Active transport	Diffusion	Osmosis	3	3 x 1.1	1 mark for each correct row
			Water moving into guard cells			✓			
			Mineral ions moving into root hair cells against a concentration gradient	✓					
			Oxygen entering red blood cells		✓				

✓✓✓

Question			Answer	Marks	AO element	Guidance
19	(a)		Any 3 from: Similarities Both humans and octopuses have nerves/neurones ✓ Both humans' and octopuses' central nervous systems/CNS have a brain ✓ Both humans and octopuses have eyes which contain receptors ✓ Differences Octopuses do not have a spinal cord / only humans have a spinal cord ✓ All nerves in octopuses connect to the brain / all impulses in octopuses go via the brain ✓	3	3 x 2.1	Answer must have a combination of similarities and differences for full marks IGNORE references to synapses ALLOW spine for spinal cord
	(b)		(Octopus') lens stays the same/does not get thicker / human lens gets thicker ✓ (The octopus') eye changes shape (when looking at a near object) / human eye does not change shape ✓	2	2 x 2.1	IGNORE reference to suspensory ligaments or ciliary body ALLOW octopus eye gets narrower or wider IGNORE eye contracts/squeezes ALLOW retina moves closer to the lens
	(c)	(i)	First check the answer on the answer line If answer = 1:10 award 2 marks $200 \div 20 = 10$ ✓ Ratio = 1:10 ✓	2	2 x 1.2	ALLOW 20 : 200 for one mark

Question			Answer	Marks	AO element	Guidance
		(ii)	Idea that they have large eyes (compared to body mass) ✓	1	2.1	ALLOW large eye size to body mass ratio DO NOT ALLOW the eye to body mass ratio is small ALLOW they have larger pupils
			So more light can enter eye (to see in low light levels) ✓	1	3.1b	ALLOW they can take in more light ALLOW they can have more rods/receptors/ larger retina to detect light

Question			Answer	Marks	AO element	Guidance
20	(a)		Auxin ✓ Ethene ✓ Gibberellins ✓ Auxin ✓	4	4 x 1.1	ALLOW Gibberellins ALLOW Cytokinins
	(b)		Meristem (cells) ✓ Divide by <u>mitosis</u> ✓	2	2 x 1.1	DO NOT ALLOW meiosis
	(c)		When the apical bud is cut off, there is no/less auxin and the lateral buds grow ✓ When the apical bud is cut off, but auxin is added, the lateral buds do not grow ✓	2	2 x 3.2a	

19

Question			Answer	Marks	AO element	Guidance																				
						ALLOW full marks for correct answers calculations based on diameters in the range 31 to 33mm eg: <table><tr><td>Diameter</td><td>31</td><td>31.5</td><td>32.5</td><td>33</td></tr><tr><td>Conversion</td><td>31000</td><td>31500</td><td>32500</td><td>33000</td></tr><tr><td>Calculation answer</td><td>11071</td><td>11250</td><td>11607</td><td>11785</td></tr><tr><td>Answer to 3 sig figs</td><td>11100</td><td>11300</td><td>11600</td><td>11800</td></tr></table>	Diameter	31	31.5	32.5	33	Conversion	31000	31500	32500	33000	Calculation answer	11071	11250	11607	11785	Answer to 3 sig figs	11100	11300	11600	11800
Diameter	31	31.5	32.5	33																						
Conversion	31000	31500	32500	33000																						
Calculation answer	11071	11250	11607	11785																						
Answer to 3 sig figs	11100	11300	11600	11800																						
	(c)		Carbon dioxide ✓	1	1.1	ALLOW CO ₂																				

Question			Answer	Marks	AO element	Guidance
22	(a)		There will be backflow (of blood in the veins) ✓	1	2.1	ALLOW (blood) will be able to flow in both directions IGNORE reference to speed of blood flow
	(b)		Swelling (of legs/feet) ✓	1	2.1	ALLOW blood clots / (muscle) cramps / numbness / itchy skin / painful legs / bulging veins on legs / tiredness / fatigue IGNORE reference to breathlessness
	(c)		Any two from: Highest incidences of varicose veins appeared in the age group 40-49/between 30 and 59/60 ✓ Fewest incidences of varicose veins were observed in those over 70 ✓ More females develop varicose veins than males ORA ✓ Males are most likely to develop varicose veins when they are 60-69 / least likely when they are 30 -39 ✓	2	2 x 3.2b	ALLOW Most incidences of varicose veins appear after 40 ✓ DO NOT ALLOW people aged 40-49 mostly have varicose veins

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	With varicose veins: $\frac{458}{43724} \times 100 = 1.0\%$ $\frac{1434}{43724} \times 100 = 3.3\%$ $\frac{1116}{43724} \times 100 = 2.6\%$ Without varicose veins: $\frac{79}{18491} \times 100 = 0.4\%$ $\frac{638}{18491} \times 100 = 3.5\%$ $\frac{472}{18491} \times 100 = 2.6\% \;;$ The percentage of participants with deep vein thrombosis was higher if they had varicose veins ✓ The percentage of participants with the other two conditions was the same/lower if they had varicose veins ✓	4	2.2 2.2 2 x 3.1b	Award 1st mark for any correct percentage calculated Award 2nd mark for any two corresponding percentages calculated enabling comparison ALLOW calculations of ratios/decimals e.g., 1 to 95 or 0.0105 IGNORE risk of deep vein thrombosis is higher if a person has varicose veins IGNORE risk of other conditions is the same or lower if a person has varicose veins
		(ii)	Any two from: Methods used are checked ✓ Conclusions formed from the data are checked ✓ Information/facts contained are checked ✓ Gives greater confidence/reliability (in the findings of the research) ✓	2	2 x 2.1	IGNORE study/experiment checked / content checked ALLOW errors/mistakes are eliminated / more likely to be accurate ALLOW trustworthy/more valid/reduce bias

Question			Answer	Marks	AO element	Guidance
23	(a)		<i>Monitoring-</i> The level of thyroxine is monitored to see if it goes too low/to high/to see if there is a change / the level of thyroxine is monitored and compared with the normal level ✓ <i>Response-</i> TSH will act on the <u>thyroid</u> gland to change the release of thyroxine ✓ <i>Effect-</i> TSH will bring the thyroxine level back to normal ✓	3	3 x 3.1a	Simple repeat of information from the diagram = no marks ALLOW detects/measures thyroxine levels to see if they are too high/too low IGNORE regulates rather than monitors ALLOW TSH raising/releasing thyroxine if too low and reducing release/lowers thyroxine if too high IGNORE TSH regulates thyroxine levels
	(b)		A ✓ B ✓	2	2 x 1.1	
	(c)		In the blood/bloodstream/blood vessels ✓ In the plasma ✓	2	2 x 1.1	ALLOW named type of blood vessel In the blood plasma = 2 marks

Question		Answer	Marks	AO element	Guidance
24	(a)	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) Describes how a change in triplet codes alters the formation of an enzyme and how this affects enzyme function. AND Describes the resulting impact on glucose levels in the blood. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Describes how a change in triplet codes can alter the formation of an enzyme and explains how a change in enzyme structure can alter enzyme function. OR Describes how a change in triplet codes can alter the formation of an enzyme and identifies the resulting impact on glucose levels in the blood. OR Explains how a change in enzyme structure can alter enzyme function and identifies the resulting impact on glucose levels in the blood. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i>	6	2 x 1.1 4 x 2.1	AO1.1 Demonstrates knowledge and understanding of scientific ideas to describe how a change the triplet code alters protein formation. - Different triplet codes will code for different (sequences of) amino acids. - Different (sequences of) amino acids result in a different protein/enzyme being formed. AO2.1 Applies knowledge and understanding to explain why a change in enzyme structure alters enzyme function. If the enzyme changes shape glycogen cannot be broken down into glucose because: - the active site is not complementary to the substrate/glycogen. - the substrate/glycogen cannot fit into/bind with the enzyme's active site. AO2.1 Applies knowledge and understanding to explain why a failure of the enzyme affects blood glucose levels - Glucose will not be released into the blood. - If the person has low blood glucose levels, they cannot raise this level / blood glucose levels may be too low/decrease

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) Describes how a change in triplet codes can alter the formation of an enzyme OR Describes how a change in enzyme structure can alter enzyme function. OR Identifies the resulting impact on glucose levels in the blood. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>			Glucagon cannot function. If reference to different types of amino acids being formed/made, then limited to Level 2
	(b)		Forms two named colours from red / orange / yellow / green ✓ Correct reference to which colour indicates highest concentration of glucose ✓ Use of a colorimeter/colour chart for comparison / compare colour to known concentrations ✓	3	3 x 1.2	Orange-red is one colour ALLOW the idea that the amount of precipitate can be used to indicate glucose concentration

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