GCE

Biology B

H022/02: Biology in depth

AS Level

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.

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. Work crossed out:

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 a tick 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 questions on this paper are **1(b) (ii)** and **2(c)**

11. Annotations available in RM Assessor

Marking Annotations

Annotation	Use
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
I	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
	Tick
^	Omission Mark
BP	Blank Page
L1	Level 1 answer in Level of Response question
L2	Level 2 answer in Level of Response question
L3	Level 3 answer in Level of Response question

12. 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

13. **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.

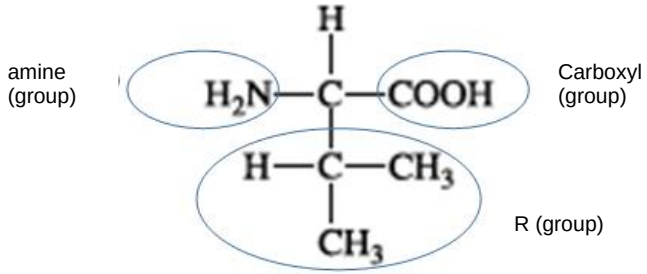
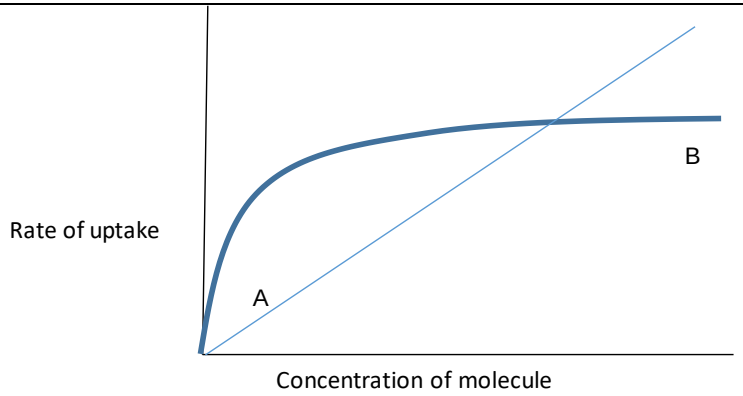
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New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

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

Question			Answer	Marks	AO element	Guidance
1	(a)	(i)	**(D)** phloem – transports assimilates ✓ **(E)** xylem – transport water <u>and</u> ions ✓	**2**	AO1.2	**ALLOW** named assimilates e.g. sucrose **IGNORE** glucose / sugar / carbohydrates
		(ii)	xylem, phloem, and epidermis correctly labelled ✓ clear continuous lines / no sketching ✓ structures in proportion **AND** diagram occupies at least 50% of available space ✓ no , colouring / shading ✓ no , individual cells drawn ✓	**Max 1** **Max 2**	AO2.3	**ECF** if **D** or **E** incorrectly labelled in (a)(i)
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 225(µm) award 2 marks** (27/120) x 1000 ✓ 225 (µm) ✓	**2**	AO2.8	

Question			Answer	Marks	AO element	Guidance
	(b*)	(i)	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)** Full and detailed method that would allow a valid comparison of the rate of transpiration with and without leaves **AND** identifies dependant, independent and controlled variables. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Detailed method that could be used to measure the rate of transpiration with and without leaves **AND** includes a description of the variables involved. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** **AND / OR** An outline of a method that could be used to measure the rate of transpiration **OR** a description of the variables involved. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.*	**6**	AO3.3	<u>Method</u> (see note below) • stem preparation ○ at an angle ○ under water ○ surface water dried off • oil on surface of water • timing • repeat to gain replicates • calculation (mean/rate) • statistical test <u>Variables</u> • Dependent variable – distance moved by coloured water / change in mass of water. • Independent variable – presence/absence of leaves • Variables that should be controlled. • Temperature • Humidity • Light intensity • Air movement Note: The equipment allows transpiration to be measured in two ways. 1) Setting up a celery stem in a beaker of water with a layer of oil on top of the water on a

			0 marks *No response or no response worthy of credit.*			balance. Allow transpiration to occur (over set time) and measure the change in mass. 2) Setting up a celery stem in a beaker of coloured water. Measure the starting point of the liquid, allow transpiration to occur (over set time) and measure the distance moved by the coloured liquid.
			Total	**13**		

Question			Answer	Marks	AO element	Guidance
2	(a)		one mark per correctly circled and labelled group ✓✓	2	AO1.1	**ALLOW** variable group **ALLOW** amino 
	(b)	(i)	**A** – *idea that* the rate increases because there are free carrier proteins / concentration of amino acids is limiting factor ✓ **B** – *idea that* the rate levels off because all carrier proteins are saturated / proteins are a limiting factor ✓	2	AO2.1	**ALLOW** channel proteins throughout **ALLOW** *idea of* increasing concentration increasing rate of diffusion **IGNORE** transport proteins
		(ii)		1	AO2.1	

Question	Answer	Marks	AO element	Guidance
(c)	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)** The interrelationship of organelles producing proteins is clearly discussed **AND** includes the levels of protein structure required to make an enzyme with the specific shape needed to break down starch. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** The interrelationship of organelles producing proteins is clearly discussed **AND** includes the levels of protein structure required to make an enzyme. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** There is some discussion of the roles of organelles involved in producing proteins **OR** levels of protein structure. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant*	**6**	3xAO1.2 3xAO2.1	<u>The organelles responsible for making proteins</u> include: • Ribosomes – responsible for reading the mRNA sequence and organising amino acids into a specific order. • Rough Endoplasmic Reticulum – attachment of ribosomes for protein synthesis / transporting proteins to the Golgi apparatus. • Golgi apparatus – responsible for modifying and repackaging proteins into secretory vesicles. • Vesicles – produced by the Golgi, transports proteins to the membrane for exocytosis <u>Levels of protein structure</u> Primary – sequence of amino acids Secondary – alpha helix or beta pleated sheet Tertiary – folding/globular protein <u>Specific shape needed to break down starch</u> Folding/tertiary structure forms the active site complementary/specific to the substrate.

Question			Answer	Marks	AO element	Guidance
			0 marks *No response or no response worthy of credit.*			
			Total	**11**		

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	G – bicuspid valve ✓ H – right ventricle ✓	2	AO1.1	**ALLOW** left atrioventricular valve
		(ii)	use a sharp scalpel / scissors to reduce the risk of slipping / injury ✓ wash hands/ wear gloves/ cover cuts/ safe disposal / disinfect equipment to reduce the risk of infection ✓ work away from others/cut away from yourself to reduce the risk of injury ✓ pin specimen down to reduce risk of injury ✓	Max 2	AO3.4	
	(b)	(i)	the volume of drink ✓ need to have equal numbers of females and males ✓ what the volunteers do between HR measurements e.g. activity level or eating ✓	Max 1	AO3.3	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 5(cm^3) award 2 marks** 4900/ 69= 71(cm^3) **AND** 5800 /76 = 76(cm^3) ✓ 76(cm^3) – 71(cm^3) = 5(cm^3) ✓	2	AO2.4	
		(iii)	glucose drink only ✓	2	AO3.4	**IGNORE** (negative) control group unqualified

Question			Answer	Marks	AO element	Guidance
			to prove glucose does not increase heart rate / increase is due to caffeine ✓			
		(iv)	SA node stimulated more frequently✓ Atrial walls contract more frequently / AW ✓ AV node transfers the impulse to the ventricles ✓ Ventricle walls contract more frequently / AW ✓ ventricles fill more / greater volume ✓	**Max 4**	AO2.1	**ALLOW** cardiac muscle for 'walls' Penalise omission of 'walls' or 'cardiac muscle' once then ECF
			Total	**13**		

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	*idea that* organisms are grouped based on common features ✓ *idea that* groups get smaller / more exclusive as you go up ✓ *idea that* fewer groups at each level as you go up ✓	**Max 1**	AO1.1	
		(ii)	*Biological species concept* *idea that* individuals of the same species are able to interbreed to produce fertile offspring ✓ *Phylogenetic species concept* *idea that* individuals of the same species share a (recent) common ancestor ✓	**2**	AO1.1	**ALLOW** same evolutionary history
	(b)	(i)	DNA /nucleic acid ✓	**1**	AO1.2	**ALLOW** RNA
		(ii)	*Conclusion **is** supported because* only one amino acid different ✓ *Conclusion **is not** supported because* only 6 species have been investigated / not all species investigated ✓ *Conclusion **is not** supported because* only considered cytochrome c ✓	**Max 2**	AO3.2	
		(iii)	the evidence is compared to humans / the evidence is not compared between rabbits and horses ✓ the different amino acids could be at different positions / rabbits and horses could have 9 differences ✓	**2**	AO3.2	
			Total	**8**		

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	Specific B-lymphocytes bind to the venom ✓ B-lymphocytes divide by mitosis / clonal expansion **AND** differentiate to produce plasma cells ✓ plasma cells produce (specific) antibodies ✓	**Max 2**	AO1.2	**ALLOW** clonal selection
		(ii)	(the horse produces) memory cells ✓ secondary response is faster ✓ *idea of* more plasma cells result in more antibody ✓	**Max 2**	AO1.2	
		(iii)	*idea that* considers the different masses of horses ✓	**1**	AO2.1	
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 37 award 2 marks** 600 x 3.5 = 2100(µg) (per horse) ✓ 78/(2100/1000) = 37 ✓	**2**	AO2.6	**ALLOW** 2.1 (mg) **ALLOW** 78/2.1 (mg)
	(c)		(the body) may recognise the horse antibodies as foreign ✓ immune response ✓ *ref to* mast cells ✓	**2**	AO1.2	**ALLOW** description of allergen binding to antibodies on mast cells / mast cells producing histamine
	(d)	(i)	antibodies bind to the cytotoxins / proteins in the venom ✓ causes agglutination ✓	**Max 2**	AO2.5	

Question			Answer	Marks	AO element	Guidance
			prevent entry / binding of venom to (body) cells ✓ destroys the proteins in the venom ✓			
		(ii)	fits into the phospholipid bilayer ✓ creates pores / holes in the membrane ✓ blood cell leaks / lyses ✓	**Max 2**	AO2.1	**ALLOW** polar region binds to phosphate group and non-polar region to fatty acid chains **ALLOW** damages the membrane **ALLOW** cytotoxins (enter the cytoplasm and) cause cell death / necrosis / apoptosis
		(iii)	less Cytotoxic T-cells to destroy infected self-cells ✓ less T-helper cells to stimulate B-lymphocytes to produce antibody ✓ less memory cells so a second infection takes longer to respond to ✓	**Max 2**	AO2.1	
			Total	**15**		

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	**FIRST CHECK THE ANSWER IN TABLE / ON ANSWER LINE** **If answer = 650 (%) award 2 marks** 300-40 = 260 ✓ (260/40) x 100 = 650 (%) ✓	**2**	**AO2.8**	
		(ii)	they could have died by other means ✓	**1**	**A3.1**	
	(b)	**(i)**	it is harder to diagnose ✓ harder to treat ✓	**2**	**AO2.1**	**ALLOW** idea of symptoms not being as noticeable to patient so medical help not sought **ALLOW** later diagnosis increases risk of metastases
		(ii)	*Appropriate because* risk of tumour in distal colon is similar in all ages ✓ risk of a proximal tumour increases with age ✓ *Not appropriate because* risk of a rectal tumour decreases with age ✓ risk of tumours in 50-64 similar to 0-49 ✓	**Max 3**	**AO3.2**	
		(iii)	PET can detect smaller tumours ✓ PET less invasive ✓ biopsy is more painful ✓	**Max 2**	**AO1.2**	**ALLOW** ORA throughout
			Total	**10**		

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