

GCE

Biology A

H020/01: Breadth in biology

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.

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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 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 posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 40% 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 or the RM Assessor messaging system, or by email.
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 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 e-mail.
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.

There are no Level of response questions on this paper .

12. Annotations available in RM Assessor

Marking Annotations

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

13. 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

14. 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	Guidance
1			A ✓	1	
2			D ✓	1	
3			D ✓	1	
4			D ✓	1	
5			C ✓	1	
6			B ✓	1	
7			C ✓	1	
8			A ✓	1	
9			C ✓	1	
10			C ✓	1	
11			D ✓	1	
12			D ✓	1	
13			B ✓	1	
14			D ✓	1	
15			B ✓	1	
16			B ✓	1	
17			D ✓	1	
18			B ✓	1	
19			A ✓	1	
20			C ✓	1	

Question		Answer	Marks	Guidance
21	(a)	<i>mean gain in mass</i> (solution at) 0.0 (mol dm⁻³) has a higher water potential than inside the (sweet potato) <u>cells</u> ✓ <i>mean loss in mass</i> (solution at) 0.8 (mol dm⁻³) has a lower water potential than inside the (sweet potato) <u>cells</u> ✓ correct ref to water moving via osmosis ✓	2 max	ALLOW symbol for water potential throughout IGNORE solute potential IGNORE concentration of water DO NOT ALLOW greater for higher MP1 & MP2 IGNORE along water potential gradient MP1 & MP2 ALLOW ORA with correct direction of water movement MP1 & MP2 ALLOW down water potential gradient MP1 & MP2
	(b)	replicate 3 at 0.1 (mol dm⁻³) / +10.3 ✓ reduces repeatability of data ✓ it increases the standard deviation / it increases the spread about the mean / it increases the range of data about the mean ✓	3	ALLOW +10.3 indicated in the table if no other numbers circled and no response written IGNORE ref to accuracy
	(c)	add 5 cm³ of 0.8 (mol dm⁻³) sucrose (concentration) to 5 cm³ of (distilled) water ✓ idea of take contents from previous tube and add to next tube with (distilled) water ✓ ref to shake(ing) / mix(ing) contents ✓	2 max	ALLOW annotated diagram ALLOW ml in place of cm³ ALLOW 'half the 0.8 (mol dm⁻³) and fill to 10cm³ distilled water' IGNORE 'repeat these steps' unqualified ALLOW 'and mix it' / stir(ing)

Question		Answer	Marks	Guidance
	(d)	plot a graph of sucrose concentration against (percentage) change in mass AND draw a line of best fit (for both plant tissues) ✓ identify the sucrose concentration via where, the line crosses the x axis / the x intercept is / there is zero percentage change ✓ higher concentration of x intercept = higher sucrose concentration in cells ✓ reference to qualitative interpretation of data ✓	2 max	ALLOW answer in form of sketched and labelled graph IGNORE ref to isotonic point unless qualified for MP2 and MP3 e.g. estimate the sucrose concentration where percentage mass change is zero. e.g. see if higher mass increase was observed indicating more water had entered due to a higher concentration of sucrose being present
		Total	9	

Question		Answer	Marks	Guidance
22	(a)	tissues are made of (a group/collection) cells AND organs are made of (two or more / a group /collection) tissues ✓	1	Must be clear that tissues are made of more than one cell and organs are made of more than one tissue
	(b) (i)	Tissue E = cambium ✓ Tissue F = phloem ✓	2	If no response check labels on picture ALLOW meristematic tissue / meristem DO NOT ALLOW stem cells DO NOT ALLOW phloem sieve tubes

Question			Answer	Marks	Guidance
		(ii)	1. pits allow water to move into, adjacent xylem vessels / other cells / lateral parts of the plant ✓ 2. (vessel) walls contain lignin, for structural support / to prevent collapse OR (vessel) walls contain lignin to prevent water loss from vessel ✓ 3. no end walls (in vessel) / hollow (vessels), for continuous water transport / continuous column of water ✓ 4. vessels are narrow to contribute to capillary action (for water transport) ✓ 5. lignin allows for adhesion of water molecules to the vessel walls ✓	2 max	DO NOT ALLOW if linked to incorrect tissue e.g. phloem DO NOT ALLOW ref to 'cell' walls IGNORE no cell walls at ends of cells ALLOW no cytoplasm / cell contents ALLOW does not impeded flow of water for continuous water transport ALLOW capillary action linked to lignin in (vessel) walls
		(c)	cell walls ✓ Casparian strip ✓ plasmodesmata ✓	3	ALLOW phonetic spelling for Casparian and plasmodesmata

Question		Answer	Marks	Guidance
	(d)	1. rolled / small leaves / leaves reduced to spines/ scales/ needles , to reduce the surface area for transpiration ✓ OR leaves reduced to spines/ scales/ needles, to reduce the surface area for transpiration ✓ 2. thick(er) waxy cuticle to reduce/prevent transpiration ✓ 3. sunken stomata / stomata in sunken pits to , maintain humidity / reduce water potential gradient / reduce transpiration ✓ 4. curled leaves / rolled leaves / hairs / spines / sunken stomata, to reduce, air movement / effect of wind / reduce water potential gradient OR curled leaves / rolled leaves / hairs / spines / sunken stomata, to, trap water vapor / increase humidity ✓ 5. reduced number of stomata/leaves , to reduce transpiration ✓ 6. hinge cells shrink when flaccid so leaf rolls , creating a humid space / to reduce transpiration ✓ 7. stomata on upper epidermis so they open into the rolled space which is more humid , to reduce transpiration ✓ 8. stomata closed during day / only open at night , to reduce transpiration ✓	2 max	IGNORE ref to fleshy leaves / deeper roots IGNORE water loss throughout ALLOW water vapor loss and/or ref to evaporation for transpiration throughout DO NOT ALLOW thorns DO NOT ALLOW thorns IGNORE regulate humidity
		Total	10	

23	(a)		(more than two) nucleotides joined by <u>phosphodiester</u> bonds OR (more than two) nucleotides joined in a condensation (reaction) ✓	1	
	(b)	(i)	unzips, (DNA) double helix / strands / molecule ✓ breaks hydrogen bonds between the , two strands / (nitrogenous/complementary/named) bases / base pairs ✓	2	ALLOW unwinds ALLOW described for MP1 e.g. 'creates 2 separate strands of DNA'
		(ii)	mutation / described ✓ change in DNA (base) sequence / order of bases changed ✓ description of types of mutation (e.g. substitution / addition / deletion / frameshift / idea of wrong complimentary base pairs being matched up (during DNA replication) etc.) ✓ e.g. exposure to (named) mutagen ✓	2 max	e.g. spontaneous / random change ALLOW wrong nucleotide / base inserted e.g A pairs with G not T DO NOT ALLOW direct ref to transcription / RNA bases / A pairing with U e.g. radiation, (named) carcinogens, (toxic) chemicals, sunlight, UV

	(c)	Checkpoint Z / M checkpoint / mitosis checkpoint ✓ because... chromosomes cannot have been, aligned correctly at the equator / attached correctly to the spindle OR not all <u>chromatids</u> have been, separated / pulled apart OR some <u>chromatids</u> have not been separated OR (daughter) cell did not receive correct number of, chromosomes/chromatids OR (daughter) cell received more than one copy of each chromosome/chromatid ✓	2	If wrong checkpoint given = 0 marks ALLOW non-disjunction ALLOW none / did not receive any ALLOW too many
	(d)	<i>Yes because...</i> 1. crushing, breaks down / opens, cell walls ✓ 2. salt, breaks hydrogen bonds between the DNA and water (molecules) / makes DNA less soluble in water ✓ 3. ethanol added to cause precipitation of DNA ✓ 4. ethanol would break down/disrupt the, plasma / cell surface / nuclear, membrane ✓ <i>No because...</i> 5. detergent not added to break down, plasma / cell surface / nuclear, membrane ✓ 6. enzyme not specified as a protease / enzyme must be a protease, to digest, (histone) proteins ✓ 7. ethanol is not (ice) cold so enzyme activity not reduced ✓	4 max	DO NOT ALLOW cell membrane and cell wall IGNORE ref to precipitation/clumping ALLOW DNA won't stay dissolved in ethanol / will clump the DNA together / DNA becomes visible DO NOT ALLOW ref to denaturing enzymes
		Total	11	

24	(a)	(i)	<table><tr><th>Statement</th><th>Level of Protein Structure</th></tr><tr><td>Disulfide bonds are formed when two cysteine amino acids in an α-globin chain come together after the alpha helix folds</td><td>tertiary</td></tr><tr><td>Haemoglobin is made up of two α-globin chains and two β-globin chains</td><td>quaternary</td></tr><tr><td>Each α-globin and β-globin chain undergoes folding into a spherical shape</td><td>tertiary</td></tr><tr><td>β-globin is an amino acid sequence, 147 amino acids in length</td><td>primary</td></tr></table>	Statement	Level of Protein Structure	Disulfide bonds are formed when two cysteine amino acids in an α -globin chain come together after the alpha helix folds	tertiary	Haemoglobin is made up of two α -globin chains and two β -globin chains	quaternary	Each α -globin and β -globin chain undergoes folding into a spherical shape	tertiary	β -globin is an amino acid sequence, 147 amino acids in length	primary	3	4 correct answers = 3 marks ✓✓✓ 3 correct answers = 2 marks ✓✓ 2 or 1 correct answer(s) = 1 mark ✓ ALLOW phonetic spelling e.g. quarternary
Statement	Level of Protein Structure														
Disulfide bonds are formed when two cysteine amino acids in an α -globin chain come together after the alpha helix folds	tertiary														
Haemoglobin is made up of two α -globin chains and two β -globin chains	quaternary														
Each α -globin and β -globin chain undergoes folding into a spherical shape	tertiary														
β -globin is an amino acid sequence, 147 amino acids in length	primary														
		(ii)	carbonic anhydrase ✓	1	ALLOW phonetic spelling ALLOW 'carbonate hydrolase'										
	(b)		FIRST CHECK ON ANSWER LINE If answer = 10, award 2 marks ✓✓ 9.5 / 9.5044919 OR (346 x 0.254 =) 87.884 (patients diagnosed with HAP) / (87.884 x 0.146 =) 12.831064 (patients died from <i>P. aeruginosa</i> infection) / 12.831064 ÷ 1.35 ✓	2	 ALLOW other decimal places/sig figs ALLOW 1 mark if 88 or 13 is seen										

	(c)	<i>Suggest Max 2</i> 1. higher / more, costs ✓ 2. use of, more antibiotics / different antibiotics / 'new' antibiotics ✓ 3. longer hospital stays / longer to recover / more people hospitalised ✓ 4. isolation of infected people / prevention of other people getting infected with antibiotic resistant bacteria ✓ 5. need for extra hygiene practices / AW ✓ <i>Explain Max 2</i> 6. causes, disability / life changing illness / organ failure ✓ 7. more / increased deaths ✓ 8. outbreak / increased rate / increased spread (of infection) ✓	Max 3	Max 2 if answer limited to 'suggest' MPs OR 'explain' MPs ALLOW private room for isolation ALLOW examples e.g. increased, hand washing / cleaning the hospital environment, extra use of, antiseptic soaps / gloves / gowns ALLOW pandemic / 'spread more/very, easily' 'Due to higher infection rates, there are much higher costs due to people staying in hospital longer' = MP8, MP1 and MP3
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	(d)	choosing medicines / drugs / treatments, based on a person's, genes / genome / genotype / genetic profile / base sequence ✓ <i>idea of medicine / treatment created for a specific patient matched to the bacterial infection they have</i> ✓	1 max	ALLOW DNA for, genes / genome
		Total	10	

25	(a)	FIRST CHECK ON ANSWER LINE If answer = 0.062, award 2 marks ✓✓ tangent drawn and is straight , meets the curve at 50s , can be any length OR difference/change/Δ in volume / $\Delta y / dy$, $\div$, difference/change/Δ in time / $\Delta x / dx$ OR calculation showing , difference / change , in volume $\div$, difference / change , in time OR correct answer to incorrect sig fig e.g. $5.6 / 90 = 0.0622$ $\text{cm}^3 \text{s}^{-1}$ ✓	2	DO NOT ALLOW interpolation alone ALLOW range 0.057-0.063 for 2 marks
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	(b)	carry out the experiment at different <u>concentrations</u> of , hydrogen peroxide / substrate ✓ without inhibitor AND with inhibitor ✓ rate (of reaction) with inhibitor (also) increases as the concentration of substrate increases OR (with inhibitor has) greater inhibition at lower concentrations of substrate / less inhibition at higher concentrations of substrate ✓	2 max	ACCEPT hydroxylamine for inhibitor
	(c)	(engulfed) pathogen inside, vesicle / phagosome ✓ lysosomes fuse/combine with phagosome / (phagocytic) vesicle formed OR phagolysosome is formed / created ✓ enzymes are released / secreted / move in (to the , vesicle / phagolysosome) OR enzymes can now act upon pathogen ✓	2 max	IGNORE vacuole IGNORE attach / bind ACCEPT lysozymes for enzymes
		Total	6	

26	(a)	1. <i>ref.</i> monoculture ✓ 2. reduces genetic diversity / (crop/s) susceptible to same disease / (crop) populations are unable to adapt to changing conditions ✓ 3. destroys / ruins , habitats ✓ 4. pesticide use may , cause bioaccumulation / kill organisms higher up the food chain / kill non targeted insects or organisms / reduce species biodiversity ✓ 5. reduce food supply further up the food chain / idea of disrupting food webs / chains ✓ 6. fertiliser may cause , eutrophication / described ✓ 7. pesticides kill pollinators / pollinating insects, reduction in pollination / reduced spread of plants ✓	3 max	ALLOW monoculture described e.g. large fields of only 1 crop ALLOW reduces (number of) habitats / habitat diversity ALLOW named habitats e.g. deforestation / removal of hedgerows
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	(b)	1. climate change ✓ 2. (human) population growth / urban expansion / urbanisation ✓ 3. pollution ✓ 4. resource exploitation / tourism ✓ 5. climax community ✓ 6. hunting / poaching ✓ 7. (named) natural disasters ✓ 8. war / civil unrest ✓ 9. introduction of invasive species ✓	1 max	ALLOW global warming ALLOW deforestation
		Total	4	

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