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.

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. A*ssistant 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
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

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)		*mean gain in mass* (solution at) 0.0 (mol dm^{-3}) has a higher water potential than inside the (sweet potato) cells ✓ *mean loss in mass* (solution at) 0.8 (mol dm^{-3}) has a lower water potential than inside the (sweet potato) cells ✓ 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 cm^3 of 0.8 (mol dm^{-3}) sucrose (concentration) to 5 cm^3 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 cm^3 **ALLOW** 'half the 0.8 (mol dm^{-3}) and fill to 10cm^3 distilled water' **ALLOW** '(10cm^3) 0.8 (mol dm^{-3}) sucrose (concentration) plus 10cm^3 (distilled) water **IGNORE 'repeat these steps'** unqualified **ALLOW** 'and mix it' / stir(ring)

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 imped 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

Question			Answer	Marks	Guidance
			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

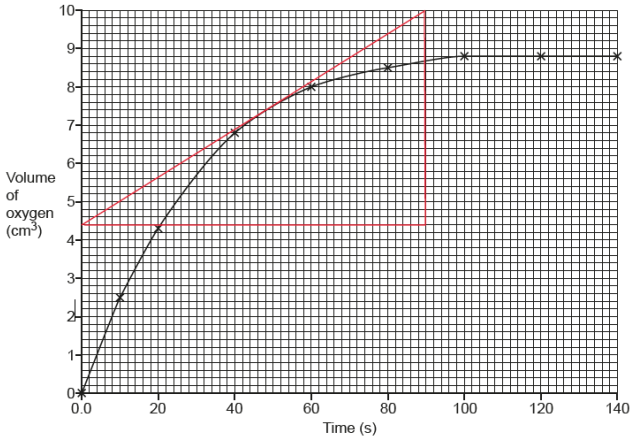
	(c)		Checkpoint Z / M checkpoint / mitosis checkpoint ✓ because… chromosomes cannot have been, aligned correctly at the equator / attached correctly to the spindle **OR** not all <u>chromatids</u> have been, separated / pulled apart **OR** some <u>chromatids</u> have not been separated **OR** (daughter) 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)		*Yes because…* 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 ✓ *No because…* 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 ✓	**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

			7. ethanol is not (ice) cold so enzyme activity not reduced ✓		**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>	**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
		(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 *P. aeruginosa* infection) / 12.831064 ÷ 1.35 ✓	**2**	**ALLOW** other decimal places/sig figs **ALLOW** 1 mark if 88 or 13 is seen

	(c)		*Suggest **Max 2***	**Max 3**	**Max 2** if answer limited to 'suggest' MPs **OR** 'explain' MPs
			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 ✓		**ALLOW** private room for isolation
			5. need for extra hygiene practices / AW ✓		**ALLOW** examples e.g. increased, hand washing / cleaning the hospital environment, extra use of, antiseptic soaps / gloves / gowns
			*Explain **Max 2***		
			6. causes, disability / life changing illness / organ failure ✓		
			7. more / increased deaths ✓		
			8. outbreak / increased rate / increased spread (of infection) ✓		**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

	(d)		choosing medicines / drugs / treatments, based on a person's, genes / genome / genotype / genetic profile / base sequence ✓ *idea of* medicine / treatment created for a specific patient matched to the bacterial infection they have ✓	**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 / Δy / dy , ÷ , difference/change/Δ in time / Δx / dx **OR** calculation showing , difference / change , in volume ÷ , difference / change , in time **OR** correct answer to incorrect sig fig e.g. 5.6 / 90 = 0.0622 $cm^3\ s^{-1}$ ✓	**2**	**DO NOT ALLOW** interpolation alone **ALLOW** range 0.057-0.063 **for 2 marks** 

	(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. *ref.* 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

	(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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