



GCE

Biology B

H022/01: Foundations of 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 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 **none**

11. 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

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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.

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Question	Answer	Marks	AO element	Guidance
1	D	1	AO1.1	
2	B	1	AO2.7	
3	D	1	AO1.1	
4	C	1	AO2.2	$70/100 \times 45 = 31.5$, Then $80/100 \times 31.5 = 25.2 \text{ dm}^3$
5	A	1	AO1.1	
6	B	1	AO1.1	
7	C	1	AO2.3	
8	B	1	AO1.2	
9	D	1	AO2.4	90% of $55 \times 80 = 3960$, Increase = $4400 + 3960$
10	B	1	AO1.1	
11	D	1	AO1.1	
12	D	1	AO1.2	
13	B	1	AO1.2	
14	C	1	AO1.1	
15	A	1	AO1.2	
16	B	1	AO2.6	
17	C	1	AO1.1	
18	C	1	AO1.2	
19	A	1	AO1.1	
20	B	1	AO1.2	
	Total	20		

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Question			Answer	Marks	AO element	Guidance
21	(a)		collection of (named) tissues ✓ (working together) to perform a specific function ✓	2	AO2.1	If tissues named there should be at least two e.g. epithelium + connective tissue IGNORE group of similar cells ALLOW same function
	(b)	(i)	(lumen of) blood vessel ✓	1	AO1.2	ALLOW (red) blood cell / erythrocyte
		(ii)	(hyaline) cartilage ✓	1	AO1.2	
	(c)	(i)	(transmission) electron microscope / TEM ✓ <i>Reason</i> high magnification / high resolution / 2D image ✓	2	AO2.1	IGNORE scanning / SEM IGNORE image is black and white
		(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 4 AND units = μm award 2 marks $10\,000 \div 2500 = 4$ ✓ μm / micrometres ✓	2	AO2.8	ALLOW correct answer in standard form with correct unit e.g. $4 \times 10^{-6} \text{ m}$ ALLOW correct response in mm or cm e.g. 0.0004 cm OR 0.004 mm
		(iii)	 1 cilia (on cells) are paralysed ✓ 2 can no longer , waft / move , mucus / pathogens , Up (the airways) ✓ OR 3 goblet cells produce more mucus ✓ 4 (mucus) builds up (in airways) causing infection ✓	max 2	AO1.1	As this is an explanation these are linked MPs. MP1 and 2 OR MP3 and 4 ALLOW cilia lie flat / no longer move DO NOT ALLOW hairs for cilia ALLOW can no longer waft particles (in smoke) up
			Total	10		

Question			Answer	Marks	AO element	Guidance
22	(a)		<i>diastolic</i> pressure in arteries when (left) ventricle is relaxed ✓ <i>systolic</i> pressure in arteries when left ventricle contracts ✓	2	AO1.1	ALLOW reflects elasticity of artery walls ALLOW reflects force generated by left ventricle
	(b)		$\frac{140}{90}$ (mmHg) ✓	1	AO1.1	ALLOW written out e.g. 140 over 90 ALLOW any answer with systolic above 130 and diastolic above 80 e.g. $\frac{135}{85}$
	(c)	(i)	10 625 ✓	1	AO2.6	$(1 \div 8) \times 85000 = 10\,625$
		(ii)	<i>idea that</i> lifestyle choice causing risk continues into adult life ✓ <i>idea that</i> they were unaware that they were at risk (from YOH) ✓ treatments not , available / suitable (for young adults) ✓	max 2	AO2.1	e.g. continued to smoke e.g. didn't change lifestyle because didn't know about the risk
		(iii)	Any TWO from: damage to heart valves ✓ damage to artery walls / atherosclerosis ✓ (develops) aneurysm ✓ (ventricular) hypertrophy / thickening of ventricle walls ✓	max 2	AO2.1	ALLOW e.g. hardening of the arteries ALLOW enlarged heart

	(iv)	<i>Advantages:</i> find , new / suitable , treatments / drugs ✓ test , existing treatments / drugs , for efficacy on YOH sufferers ✓ gain (more) information ✓ <i>Disadvantages: max 3</i> may be difficult to find participants (in this age group) ✓ no / few , existing , drugs / treatments , to compare with new ✓ takes a long time before , results are obtained / changes can be made ✓ side effects of , drugs / treatments ✓ other factors could be responsible (for hypertension) ✓	max 4	AO2.5	Internal max 3 for disadvantages
	(d)	hydrostatic ✓ oncotic / osmotic ✓ lymph vessel / lymph(atic) system ✓	3	AO1.1	
		Total	15		

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Question			Answer	Marks	AO element	Guidance
23	(a)	(i)	maintain pH ✓ prevent damage to , chloroplasts / membranes ✓	max 1	AO3.2	
		(ii)	ensures (chemical) equilibrium is reached (in solution) ✓	1	AO3.2	ALLOW <i>idea that</i> the concentration of carbon dioxide became constant
	(b)	(i)	<u>time</u> (s) on x axis and <u>concentration</u> of carbon dioxide ($\mu\text{mol dm}^{-3}$) on y axis AND appropriate scales with 50% paper covered ✓ points plotted correctly +/- 1 small square ✓ appropriate line drawn that begins at origin ✓	3	AO2.8	ALLOW CO ₂ for carbon dioxide ALLOW 2 errors e.g. 6 out of 8 points gains the mark ALLOW ECF from plotted points ALLOW dot to dot joining of points
	(b)	(ii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = $3 (.3) \times 10^{-3} (\mu\text{mol dm}^{-3}\text{s}^{-1})$ award 2 marks tangent drawn or correct reading of concentration from where 275 s meets the line ✓ y ÷ 275 ✓	2	AO2.8	For two marks ALLOW any number within range $2(.0) \times 10^{-3}$ to $4(.0) \times 10^{-3}$ ALLOW any decimal places e.g. 3.3333 ALLOW ECF for an incorrect graph e.g. two marks for any correct calculation of $y \div 275$ if clearly indicated on graph max one mark only if answer not given in standard form max one mark only if no evidence of using graph to get a value for y

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Question			Answer	Marks	AO element	Guidance
		(iii)	(CO₂ taken up by) <u>diffusion</u> ✓ AND any two from: (chloroplast membrane) is highly permeable to CO₂ ✓ (as) CO₂ concentration in solution decreases (rapidly) , from 200s / after chloroplasts added ✓ graph levels out at 300s / AW ✓	3 max	AO3.2	
			Total	10		

Question			Answer	Marks	AO element	Guidance
24	(a)		fetal feet are webbed in <u>both</u> species ✓ apoptosis / programmed cell death , occurs ✓ greater <u>er</u> , cell death / apoptosis , between toes of chickens ✓ produces distinct toes in chickens ✓	3	AO2.5	ALLOW ORA ALLOW ORA e.g. ducks do not get distinct toes e.g. adult duck feet remain webbed
	(b)	(i)	can (only) differentiate ✓ into , limited / few , cell types ✓	2	AO1.2	ALLOW named example e.g. cells in bone marrow differentiate into blood cells
		(ii)	bone marrow ✓	1	AO1.1	ALLOW compact bone / bone of femur
		(iii)	<i>could be used</i> to , differentiate / specialise ✓ into , bone / muscle , cells ✓	2	AO3.2	
			Total	8		

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Question			Answer	Marks	AO element	Guidance								
25	(a)		<table><tr><th>Level of biodiversity</th><th>Definition</th></tr><tr><td>Ecosystem diversity</td><td>community of number of species and interactions with their abiotic environment / AW ✓</td></tr><tr><td>Genetic diversity</td><td>measure of variety of genes in a species / AW ✓</td></tr><tr><td>Species diversity</td><td>measure of number of species and relative abundance of individuals in each species / species richness and species evenness ✓</td></tr></table>	Level of biodiversity	Definition	Ecosystem diversity	community of number of species and interactions with their abiotic environment / AW ✓	Genetic diversity	measure of variety of genes in a species / AW ✓	Species diversity	measure of number of species and relative abundance of individuals in each species / species richness and species evenness ✓	3	AO1.1	One mark per row ALLOW alleles for genes
Level of biodiversity	Definition													
Ecosystem diversity	community of number of species and interactions with their abiotic environment / AW ✓													
Genetic diversity	measure of variety of genes in a species / AW ✓													
Species diversity	measure of number of species and relative abundance of individuals in each species / species richness and species evenness ✓													

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	(b)	(i)	<table><tr><td></td><td>Population 1</td><td>Population 2</td><td>Population 3</td></tr><tr><td>Number of monomorphic genes</td><td>11</td><td>5</td><td>6</td></tr><tr><td>Number of polymorphic genes</td><td>13</td><td>4</td><td>5</td></tr><tr><td>Percentage of polymorphic genes (%)</td><td>54</td><td>44</td><td>45</td></tr></table> ✓✓		Population 1	Population 2	Population 3	Number of monomorphic genes	11	5	6	Number of polymorphic genes	13	4	5	Percentage of polymorphic genes (%)	54	44	45	2	AO2.1	All three correct 2 marks Any two correct answers 1 mark One correct = 0
	Population 1	Population 2	Population 3																			
Number of monomorphic genes	11	5	6																			
Number of polymorphic genes	13	4	5																			
Percentage of polymorphic genes (%)	54	44	45																			
		(ii)	proportion of polymorphic genes is measure of diversity ✓ diversity within populations is lower than in species (as a whole) ✓ calculation using data ✓	2	AO3.2	ALLOW ora e.g. mean % of polymorphic genes of 3 populations calculated e.g. 47.7 / 48%																
			Total	7																		

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