



Oxford Cambridge and RSA

GCE

Biology A

H020/01: Breadth in biology

AS Level

Mark Scheme for June 2023

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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. There is a NR (No Response) option. Award NR (No Response)
 - if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
 - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

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.

There are no Level of response questions on this paper.

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

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	Guidance
1		B ✓	1	
2		A ✓	1	ALLOW if labelled correctly on image
3		B OR C ✓	1	
4		C ✓	1	
5		D ✓	1	
6		A ✓	1	
7		C ✓	1	
8		C ✓	1	
9		C ✓	1	
10		B ✓	1	
11		D ✓	1	
12		B ✓	1	
13		A ✓	1	
14		D ✓	1	
15		D ✓	1	
16		C ✓	1	
17		D ✓	1	
18		B ✓	1	
19		D ✓	1	
20		C ✓	1	
		Total	20	

Question		Answer	Marks	Guidance
21	(a)	thin layer / flattened cells / single layer of (epithelium) cells ✓ <i>idea of close to many capillaries ✓</i>	1 max	MARK FIRST ANSWER ONLY IGNORE short diffusion distance (as not a feature but a property) ALLOW alveolar wall, one cell thick / thin ALLOW alveoli 1 cell thick ALLOW squamous, epithelium / cells DO NOT ALLOW 'thin cell wall' or 'thin membrane' ALLOW e.g. 'surrounded by capillary network' / good blood supply
	(b)	bronchiole ✓	1	ALLOW broncheole, bronchioles
	(c)	smooth muscle ✓ contracts to , constrict / close / AW , bronchiole OR relaxes to , dilate / open , bronchiole ✓	2	ALLOW involuntary muscle IGNORE contraction / relaxation of bronchiole
Total			4	


Question		Answer	Marks	Guidance
22	(a)	(i) induced fit ✓	1	
		(ii) (changes to active site cause formation of) stronger bonds between chitin and chitinase ✓ bonds in chitin are, weakened / put under strain ✓ lower activation energy ✓	2 max	
	(b)	(i) FIRST CHECK ON ANSWER LINE If answer = 0.048 award 2 marks 0.12 / 250 = 0.00048 ✓ x 100 ✓	2	ALLOW if 0.048 seen anywhere in answer space

Question		Answer	Marks	Guidance
	(ii)	<p><i>pipette R because...</i></p> <p>(it has the) highest resolution ✓</p> <p>(it has the) lowest , uncertainty / percentage error ✓</p> <p>fewer, random / measurement , errors ✓</p> <p>(larger volume therefore) fewer , uses / transfers / measurements , required ✓</p>	2 max	<p>No mark for selecting pipette R, but a maximum of 1 mark should be awarded if a different pipette is selected.</p> <p>ALLOW 'smallest gaps between graduations' ALLOW idea that measurement lines are closest together IGNORE best resolution</p> <p>ALLOW ORA if refer to both P & Q</p> <p>ALLOW improves accuracy ALLOW ORA if refer to both P & Q ALLOW can transfer 5cm³ in one go</p>
		Total	7	

Question		Answer	Marks	Guidance
23	(a)	hydrolysis and (water added and) peptide bonds broken ✓	1	ALLOW hydrolysis of peptide bonds
	(b)	(i) FIRST CHECK ON ANSWER LINE If answer = 0.6 award 2 marks 3.6/6 ✓ = 0.6 ✓	2	ALLOW 0.58 – 0.62 3.5/6 = 0.58 3.7/6 = 0.62 ALLOW ecf for correct calculation and correct rounding after incorrect measurement of valine position and / or solvent front Allow answers to two decimal points, if more decimal points used max 1 mark
	(b)	(ii) different , polarity / charges / functional groups ✓	1	ALLOW serine more polar ORA IGNORE 'chemical properties different' IGNORE ref to size (of R group), IGNORE ref to solubility (of R group)
		Total	4	

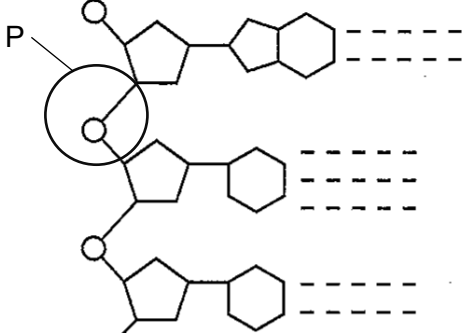

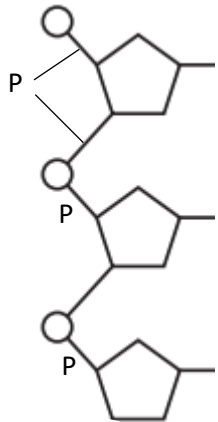
Question		Answer	Marks	Guidance
24	(a)	<p><i>idea of</i> gradual changes in (width of cell wall in) species A over many years ✓</p> <p><i>idea of</i> no evidence from the graph that the mechanism of evolution is natural selection ✓</p> <p><i>idea of</i> no evidence that cell wall changes were advantageous (to support natural selection) ✓</p>	2	<p>e.g. 'the width of the cell wall in A becomes smaller than B over millions of years, which suggests evolution'</p> <p>DO NOT ALLOW wall of A has increased over many years</p> <p>Note: 'shows evidence for evolution by natural selection as changes to A occur over many years' = 1 mark</p> <p>e.g. no evidence of changes to population size (as a result of changes to wall width)</p>
	(b)	<p>0.979 / r_s, is greater than, 0.429 (at $p=0.05$) / 0.582 (at 0.01) ✓</p> <p>(therefore) <u>significant</u> (positive) correlation at ($p =$), 0.05 / 0.01 ✓</p> <p>(indicates greater than, 95% / 99%, probability that correlation) is not due to chance ✓</p> <p>H_0 / null hypothesis, can be rejected (at $p = 0.05$ and 0.01) ✓</p>	3 max	<p>ALLOW 'student's r_s value is greater than the critical value for $n = 16$'</p> <p>DO NOT ALLOW ref to data for other values of n</p> <p>ALLOW 'there is a <u>significant</u> (positive) correlation between the two sets of data'</p> <p>IGNORE ref to 'strong' correlation DO NOT ALLOW ref to negative correlation</p> <p>ALLOW 'less than, 1% / 5%, probability that correlation is due to chance'</p>
	(c)	<p>classification ✓ four / 4 ✓ Archaea ✓</p>	3	<p>ALLOW Archea / Archaeobacteria</p>
Total			8	

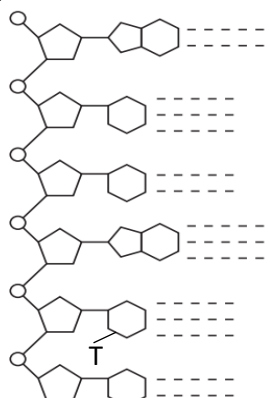
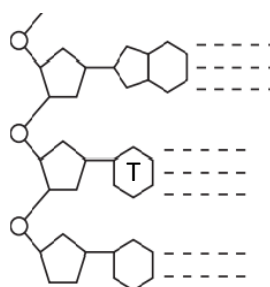
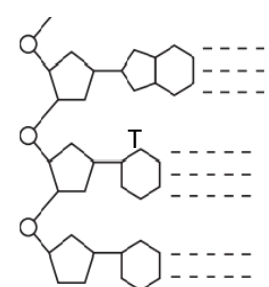
Question		Answer	Marks	Guidance
25	(a)	<p><i>idea of barrier between cell (contents) and environment ✓</i></p> <p>regulates which substances , enter / leave , the cell ✓</p> <p>site of (chemical) reactions ✓</p> <p>cell communication / cell signalling ✓</p>	2 max	<p>ALLOW (partially permeable to) control which substances move across the membrane</p> <p>ALLOW binding of, signalling molecules / hormones</p>
	(b)	<p><i>Idea that the temperature would need to be known to conclude what effect cholesterol has ✓</i></p> <p>(cholesterol) increases fluidity at low temperatures ✓</p> <p>(cholesterol) decreases fluidity at , high temperatures / body temperature / 36-38°C ✓</p> <p>one example of other factor that affects fluidity ✓</p>	3 max	<p>e.g.. the effect of cholesterol is dependent on temperature</p> <p>IGNORE temperature needs to be controlled</p> <p>temperature, concentration of saturated fatty acids, concentration of unsaturated fatty acids, relative proportions of saturated and unsaturated fatty acids, presence of solvent</p>
Total			5	

Question		Answer	Marks	Guidance
26	(a)	<p>simple line drawing of the heart with continuous and non-overlapping lines ✓</p> <p>no shading and covers at least half the box ✓</p> <p>left ventricle labelled (left bottom chamber) ✓</p>	3	<p>Place three annotations in vertical column to left hand side of the diagram in order of marks in mark scheme</p> <p>Note diagram should be at least half the vertical size of the space provided IGNORE absence of the blood vessels shown in the photograph</p> <p>DO NOT ALLOW if label line is not ruled or has arrowhead</p> <p>e.g. 3 marks for this:</p> 
	(b) (i)	double and closed ✓	1	

	(ii)	<p><i>idea of high, metabolic demands / activity levels ✓</i></p> <p><i>small(er) SA:V ratio / diffusion pathway too long ✓</i></p> <p><i>for, transport / delivery / supply, of (named) substances ✓</i></p>	2 max	<p>ALLOW ORA if they talk about small(er) organisms throughout</p> <p>ALLOW birds fly and therefore use a lot of energy</p> <p>IGNORE high metabolic <u>rate</u></p> <p>ALLOW diffusion, too slow / would take too long</p> <p>e.g. of named substances: oxygen, carbon dioxide, glucose, metabolic wastes</p>
	(c)	<p><i>in bird ECG...</i></p> <p><i>idea of (Q)R(S) (wave) moves down instead of moving up ✓</i></p> <p><i>no gap between (QR)S and T ✓</i></p> <p><i>higher T (wave) ✓</i></p> <p><i>faster heart rate ✓</i></p>	2 max	<p>assume answer refers to the bird ECG unless otherwise stated.</p> <p>ALLOW ORA for human ECG statements</p> <p>ALLOW ventricular, wave / systole, moves down instead of up</p> <p>ALLOW (ventricular) diastole (wave) higher</p> <p>IGNORE beats faster</p> <p>ALLOW more beats per second / higher bpm</p>
		Total	8	

Question			Answer	Marks	Guidance														
27	(a)	(i)	<p><i>idea of</i> changes protein production (inside cells) ✓</p> <p>(some of these) proteins are secreted to affect, other cells / growth / embryo development ✓</p> <p>increased protein synthesis requires more energy ✓</p> <p>rate of respiration increases (to supply ATP) ✓</p>	2 max	<p>e.g. 'TET enzymes cause new proteins to be made in the cell' / proteins to be made at a higher rate / more proteins made</p> <p>ALLOW proteins are secreted to cause faster growth DO NOT ALLOW ref to excretion of proteins</p>														
		(ii)	cofactor / coenzyme ✓	1	IGNORE 'activator'														
		(iii)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Enzyme</th> <th colspan="2">Type of reaction catalysed</th> </tr> <tr> <th>Intracellular</th> <th>Extracellular</th> </tr> </thead> <tbody> <tr> <td>TET</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>catalase</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>trypsin</td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table> <p style="text-align: right;">✓</p>	Enzyme	Type of reaction catalysed		Intracellular	Extracellular	TET	✓		catalase	✓		trypsin		✓	1	IGNORE crosses ✓
Enzyme	Type of reaction catalysed																		
	Intracellular	Extracellular																	
TET	✓																		
catalase	✓																		
trypsin		✓																	

	<p>(b)</p>	<p>(i)</p>	<p>P labelling a, bond / link, between two nucleotides in the sugar-phosphate backbone ✓</p>	<p>1</p>	<p>e.g.</p>  <p>ALLOW P labelling a bond between a deoxyribose and a phosphate</p> <p>e.g.</p>  <p>OR</p> <p>ALLOW If more than one bond labelled, e.g.</p> 
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	<p>(ii) T labelling the 5th (2nd from bottom) base ✓</p>	<p>1</p>	<p>e.g.</p>  <p>ALLOW T written inside or next to cytosine without a label line, e.g.</p>  <p>OR</p>  <p>ALLOW correct base labelled as C (for cytosine) DO NOT ALLOW if a second T has been included elsewhere on the diagram</p>
	<p>Total</p>	<p>6</p>	

28	(a)				4	<p>one mark per correct row</p> <p>IGNORE crosses</p>	
		organelle	a membrane-bound organelle	found in both animal and plant cells			has a role in lipid production
		rough endoplasmic reticulum	✓	✓			
		smooth endoplasmic reticulum	✓	✓			✓
		ribosome		✓			
mitochondrion	✓	✓					

	(b)	<p><i>glucose</i> soluble / polar ✓</p> <p>has chemical energy in its bonds OR is a, respiratory substrate / source of energy ✓</p> <p><i>starch / glycogen</i> insoluble and compact OR large(r), SA ✓</p> <p>used for (energy / glucose) storage / allows quick release (of stored energy / glucose) ✓</p> <p><i>idea that glycogen is broken down faster than starch due to, higher SA / many branch ends ✓</i></p>	4	<p>IGNORE descriptions of structure (e.g. 'glycogen is branched') IGNORE misspelling of 'glycogen' throughout</p> <p>ALLOW release, energy / ATP</p> <p>IGNORE starch / glycogen, can be stored</p> <p>IGNORE broken down more easily</p>
		Total	8	

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