OCR
Oxford Cambridge and RSA

GCE

Biology A

H020/01: Breadth in biology

AS Level

Mark Scheme for June 2023

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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. 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
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	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 ✓ *idea of* close to many capillaries ✓	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	

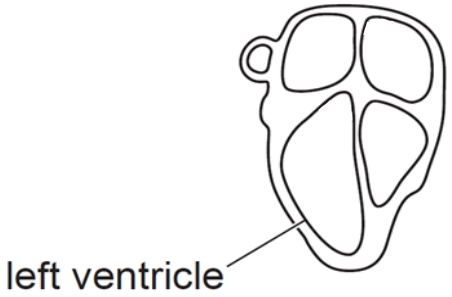
Question			Answer	Marks	Guidance
22	(a)	(i)	induced fit ✓	1	
		(ii)	(changes to active site cause formation of) stronger bonds between chitin and chitinase ✓ bonds in chitin are, weakened / put under strain ✓ lower activation energy ✓	2 max	
	(b)	(i)	**FIRST CHECK ON ANSWER LINE** **If answer = 0.048 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)	*pipette R because…* (it has the) highest resolution ✓ (it has the) lowest , uncertainty / percentage error ✓ fewer, random / measurement , errors ✓ (larger volume therefore) fewer , uses / transfers / measurements , required ✓	**2 max**	No mark for selecting pipette R, but a maximum of 1 mark should be awarded if a different pipette is selected. **ALLOW** 'smallest gaps between graduations' **ALLOW** idea that measurement lines are closest together **IGNORE** best resolution **ALLOW** ORA if refer to both P & Q **ALLOW** improves accuracy **ALLOW** ORA if refer to both P & Q **ALLOW** can transfer 5cm^3 in one go
			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)		*idea of* gradual changes in (width of cell wall in) species A over many years ✓ *idea of* no evidence from the graph that the mechanism of evolution is natural selection ✓ *idea of* no evidence that cell wall changes were advantageous (to support natural selection) ✓	2	e.g. 'the width of the cell wall in A becomes smaller than B over millions of years, which suggests evolution' **DO NOT ALLOW** wall of A has increased over many years **Note:** 'shows evidence for evolution by natural selection as changes to A occur over many years' = 1 mark e.g. no evidence of changes to population size (as a result of changes to wall width)
	(b)		0.979 / r_S, is greater than, 0.429 (at p=0.05) / 0.582 (at 0.01) ✓ (therefore) <u>significant</u> (positive) correlation at (p =), 0.05 / 0.01 ✓ (indicates greater than, 95% / 99%, probability that correlation) is not due to chance ✓ H_0 / null hypothesis, can be rejected (at p = 0.05 and 0.01) ✓	3 max	**ALLOW** 'student's r_s value is greater than the critical value for n = 16' **DO NOT ALLOW** ref to data for other values of n **ALLOW** 'there is a <u>significant</u> (positive) correlation between the two sets of data' **IGNORE** ref to 'strong' correlation **DO NOT ALLOW** ref to negative correlation **ALLOW** 'less than, 1% / 5%, probability that correlation is due to chance'
	(c)		classification ✓ four / 4 ✓ Archaea ✓	3	 **ALLOW** Archea / Archaebacteria
			Total	8	

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

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

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

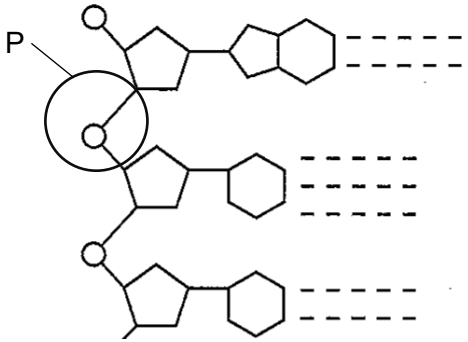
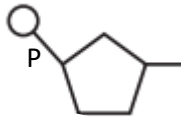
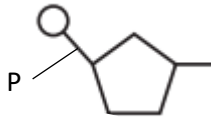
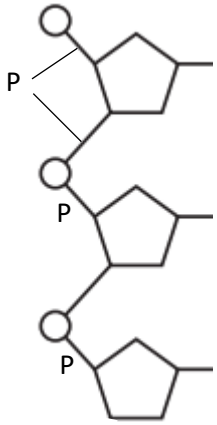
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>27</td><td>(a)</td><td>(i)</td><td>idea of changes protein production (inside cells) ✓

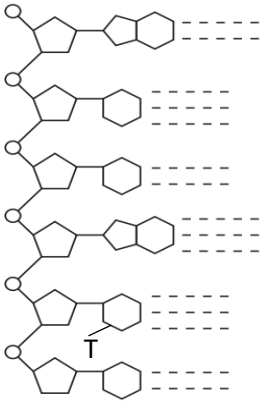
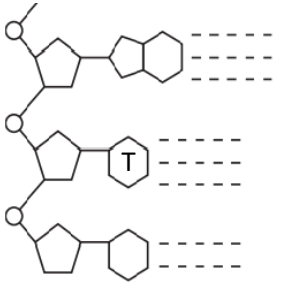
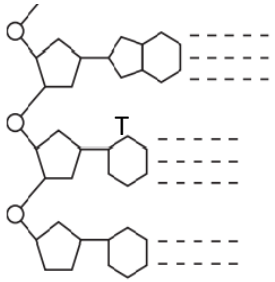
(some of these) proteins are secreted to affect,
other cells / growth / embryo development ✓

increased protein synthesis requires more energy ✓

rate of respiration increases (to supply ATP) ✓</td><td>2 max</td><td>e.g. ‘TET enzymes cause new proteins to be made in the cell’ / proteins to be made at a higher rate / more proteins made

ALLOW proteins are secreted to cause faster growth
DO NOT ALLOW ref to excretion of proteins</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>cofactor / coenzyme ✓</td><td>1</td><td>IGNORE ‘activator’</td></tr>
<tr><td></td><td></td><td>(iii)</td><td><table><tr><th rowspan="2">Enzyme</th><th colspan="2">Type of reaction catalysed</th></tr><tr><th>Intracellular</th><th>Extracellular</th></tr><tr><td>TET</td><td>✓</td><td></td></tr><tr><td>catalase</td><td>✓</td><td></td></tr><tr><td>trypsin</td><td></td><td>✓</td></tr></table>✓</td><td>1</td><td>✓
IGNORE crosses</td></tr>
</table>

	(b)	**(i)**	P labelling a, bond / link, between two nucleotides in the sugar-phosphate backbone ✓	**1**	e.g.  **ALLOW** P labelling a bond between a deoxyribose and a phosphate e.g.  **OR**  **ALLOW** If more than one bond labelled, e.g. 

		(ii)	T labelling the 5th (2nd from bottom) base ✓	**1**	**e.g.**  **ALLOW** T written inside or next to cytosine without a label line, e.g.  **OR**  **ALLOW** correct base labelled as C (for cytosine) **DO NOT ALLOW** if a second T has been included elsewhere on the diagram
			Total	**6**	

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

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

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