OCR
Oxford Cambridge and RSA

GCE

Biology A

H020/01: Breadth in biology

AS Level

Mark Scheme for June 2022

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 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.

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. 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 'seen' annotation or a 'large dot' to confirm that the work has been seen or a tick if a mark is awarded. If the extra pages are blank then add a 'BP' annotation to confirm the page 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).

   Annotate the script with an 'omission mark' to show the response has been seen

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 is 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**

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

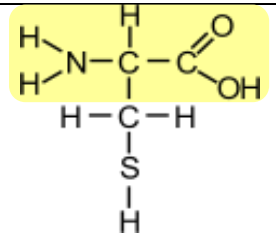
- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

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.

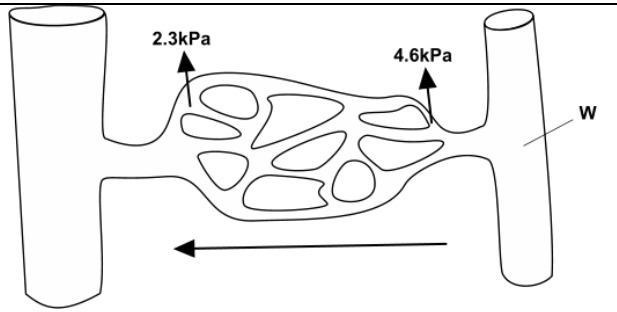
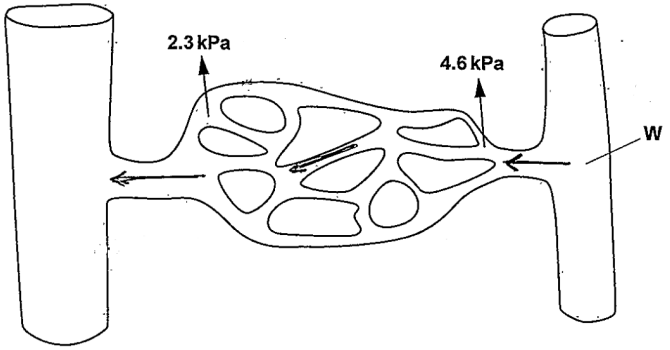
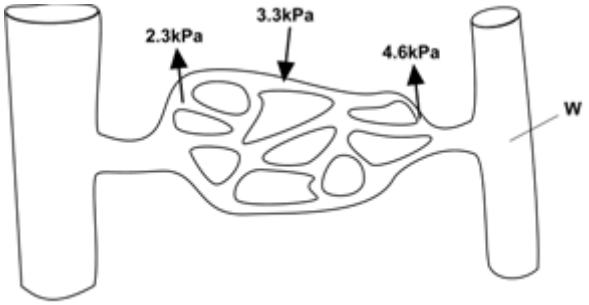
Question			Answer	Mark	Guidance
1			C ✓	1	
2			D ✓	1	
3			B ✓	1	
4			C ✓	1	
5			B ✓	1	
6			C ✓	1	
7			D ✓	1	
8			B ✓	1	
9			B ✓	1	
10			C ✓	1	
11			A ✓	1	
12			B ✓	1	
13			C ✓	1	
14			A ✓	1	
15			C ✓	1	
16			A ✓	1	
17			C ✓	1	
18			D ✓	1	
19			B ✓	1	
20			A ✓	1	

Question			Answer	Mark	Guidance
21	(a)		R group attached to central carbon ✓ amine group on (one side of) central carbon ✓ carboxyl group on (the other side of) central carbon ✓	3	 **ALLOW** amine and carboxyl group either way round **ALLOW** -NH_2 , -COOH **IGNORE** separate diagram showing the generalised structural formula
21	(b)		insulin is made from <u>two</u>, polypeptide chains / amino acid chains / primary structures ✓ chains joined by disulfide bonds (between, cysteine / CYS) ✓	2	**IGNORE** 'multiple chains' or 'more than one' **ALLOW** disulfide bridges
21	(c)	(i)	change in primary structure changes, tertiary structure / 3D shape ✓ (tertiary structure / 3D shape) no longer complementary (to shape of enzyme) ✓ less likely to be broken down by enzymes / enzyme-substrate complexes less likely to form ✓ change in solubility ✓	Max 1	**ALLOW** change in complementary shape **IGNORE** takes longer to be broken **ALLOW** can't be broken down easily / harder to break down **DO NOT ALLOW** can't be broken down by enzyme / ESC can't be formed **ALLOW** more or less **DO NOT ALLOW** ref to insulin glargine being insoluble

Question			Answer	Mark	Guidance
21	(c)	(ii)	AAT / AAC ✓ is replaced by, GGT / GGC / GGA / GGG ✓	2	For two marks: **ALLOW** 1st A and 2nd A replaced by GG. **ALLOW** A replaced by G twice **ALLOW** 2 A's replaced by 2 G's For one mark: **ALLOW** A replaced by G
21	(c)	(iii)	1. (modified gene undergoes) transcription (in nucleus)✓ 2. production of (modified) mRNA / described ✓ 3. mRNA, leaves nucleus / goes to ribosomes ✓ 4. translation at ribosome(s) ✓ 5. tRNA with specific amino acid binds its anticodon (to codon of mRNA) ✓ 6. (formation of) peptide bonds between amino acids ✓	Max 4	

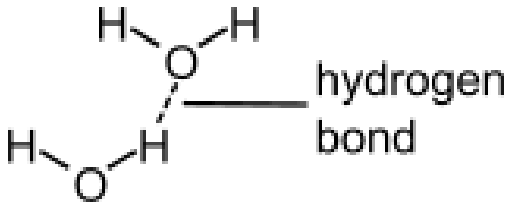
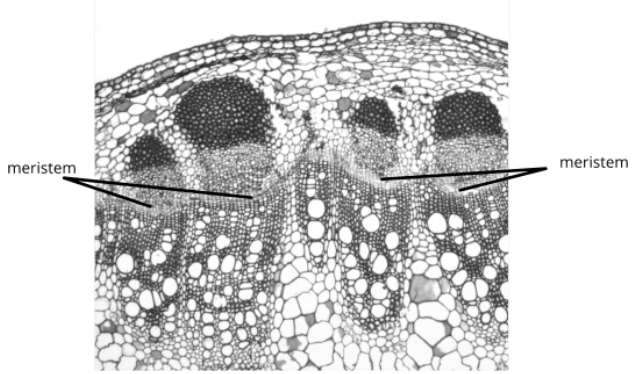
Question			Answer	Mark	Guidance
22	(a)		habitat (biodiversity) **and** (which is) the number of different habitats / a range of different habitats (in an, ecosystem / area) ✓ species (biodiversity) **and** (which is) the richness **and** evenness of a species / the number of different species (in an ecosystem / community) ✓	2	**DO NOT ALLOW** the number of different habitats in a community **DO NOT ALLOW** species richness or species evenness as the name **DO NOT ALLOW** in a population
22	(b)	(i)	0.07(03125) ✓✓	2	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.07(03125) award 2 marks** **ALLOW** correct answer anywhere in answer space **ALLOW** 7(.03125)% for two marks If correct answer not given then: **ALLOW** one mark for: number of polymorphic gene loci / total gene loci **OR** 18 / 256 **OR** 9 / 128
22	(b)	(ii)	sample not random ✓ sample not large enough ✓ may have sampled different, zoos / individuals ✓ may not have sampled the same gene loci ✓	Max 2	**ALLOW** sample was, biased / less representative / Unrepresentative **ALLOW** only 256 loci sampled **ALLOW** smaller sample

Question			Answer	Mark	Guidance
22	(b)	(iii)	the, population / gene pool, has become (very) small (due to, hunting / habitat destruction / disease susceptibility) ✓ (so) few(er), gene variants / alleles ✓ (so) inbreeding maintains, the same alleles / small gene pool ✓ only (rare) mutation can introduce, new / different, alleles ✓	Max 3	**ALLOW** ref to bottleneck **ALLOW** population / gene pool, has become limited **IGNORE** population gets smaller **ALLOW** low(er) genetic diversity **ALLOW** genetic diversity decreased **IGNORE** inbreeding reduces gene pool

Question			Answer	Mark	Guidance
23	(a)	(i)	arrow drawn from right to left ✓	1	 **ALLOW** 
23	(a)	(ii)	arrow pointing into capillary (anywhere) ✓ value (next to arrow) between 2.4kPa and 4.5kPa ✓	2	 Note: arrow must be touching or must enter capillary

Question			Answer	Mark	Guidance
23	(a)	(iii)	arteriole ✓	1	**Mark first answer only**
23	(b)		(named) plasma proteins ✓ (are) too large to, leave the capillary / fit between gaps in the endothelium ✓ (so) creates a low water potential (in the capillary) ✓ water potential is lower than in tissue fluid ✓ water moves, by osmosis / down the water potential gradient, into capillary (causing pressure) ✓	Max 3	**ALLOW** water potential is decreased **ALLOW** water potential in tissue fluid is higher than in blood **ALLOW** water moves from high WP to low WP into capillary **IGNORE** tissue fluid moves by osmosis into capillary

Question			Answer	Mark	Guidance
24	(a)	(i)	sucrose, diffuses / moves down a concentration gradient, into the, Visking tubing bag / delivery tube ✓	1	**DO NOT ALLOW** sucrose solution diffuses
24	(a)	(ii)	water potential inside the Visking tubing is reduced ✓ (water potential inside the Visking tubing) is lower than the water potential in the beaker ✓ (so) water moves, by osmosis / down water potential gradient, into the Visking tubing ✓ pushing water into the capillary ✓	Max 2	**ALLOW** pushing / moving, coloured water up
24	(a)	(iii)	phloem / sieve tube (element) ✓ xylem ✓ companion cell ✓	3	**Mark first answer only** **ALLOW** named surrounding tissue eg. parenchyma
24	(b)		0.05 ✓✓	2	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.05 (mm^3s^{-1}) award 2 marks** **ALLOW** correct answer anywhere in answer space **ALLOW** 0.052(4) for two marks **ALLOW** additional significant figures for one mark e.g. 0.0523667 If correct answer not given then, **ALLOW** one mark for: 6.28 / 6.3 (mm^3) Note: allow additional figures after the decimal point x / 120 (i.e. a mark for knowing that the volume must be divided by the time)

Question			Answer	Mark	Guidance
25	(a)	(i)	water molecules correctly drawn ✓ horizontal / vertical, dashed line between **H** of one molecule and **O** of the adjacent molecule ✓ hydrogen bond labelled ✓	3	
25	(a)	(ii)	cohesion, attracts / holds, water molecules together ✓ allows chain of water molecules to be pulled up xylem ✓ adhesion allows water molecules, to stick / AW, to xylem vessel <u>walls</u> ✓ (moving water up vessel) by capillary action ✓ (water as) a solvent to dissolve, sucrose / assimilates, for, transport in the phloem / translocation **OR** (water as) a solvent to dissolve ions for transport in the, xylem / transpiration stream ✓	Max 3	**ALLOW** cohesion, water molecules form hydrogen bonds with each other **ALLOW** named ions /correct ion formulae
25	(b)	(i)	meristem correctly identified ✓ ruler used **and** no arrow on label ✓	2	 **ALLOW** any **one** of the four areas

					ALLOW cambium instead of meristem for the label
Question			**Answer**	**Mark**	**Guidance**
25	**(b)**	**(ii)**	light microscope ✓ **Any two from:** low magnification✓ low resolution / resolution is not high enough for TEM/SEM ✓ can see, tissues / whole cells ✓	Max 3	 **IGNORE** lower **ALLOW** cannot see, organelles / components of cells / ultrastructure If candidate answers transmission mic on top line: **ALLOW** mark for 2D **IGNORE** not 3D
25	**(c)**		(source of), undifferentiated / unspecialised, cells ✓ for growth / to repair (damaged) tissue ✓ can differentiate into, other / named, tissues or cells ✓	Max 2	**ALLOW** where undifferentiated cells are produced **DO NOT ALLOW** growth of cells e.g. xylem vessel (elements) / phloem sieve tube (elements) **ALLOW** specialise
25	**(d)**		(medical) research ✓ treatment of, Alzheimer's / Parkinson's / named neurological condition ✓ to, repair / replace, (damaged) tissue / named (damaged) tissue ✓ AVP ✓	Max 1	 e.g. spinal cord injury, retinopathy, paralysis e.g. skin / pancreatic tissue / islets of Langerhans / heart tissue / bone marrow / nervous tissue / nerves e.g. transplant stem cells for treatment of leukaemia / growing organs for transplant / treatment of blindness

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