OCR
Oxford Cambridge and RSA

Higher

GCSE

Biology A Gateway

J247/03: Paper 3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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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 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:

   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks

   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

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.

Level of response question on this paper is **24(a).**

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

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.

The breakdown of Assessment Objectives for GCSE (9-1) in Biology:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	C ✓	1	1.1	
2	B ✓	1	1.2	
3	D ✓	1	1.1	
4	A ✓	1	1.1	
5	C ✓	1	1.1	
6	A ✓	1	1.1	
7	C ✓	1	1.1	
8	C ✓	1	2.1	
9	A ✓	1	2.2	
10	A ✓	1	1.1	
11	D ✓	1	1.1	
12	B ✓	1	2.2	
13	B ✓	1	2.1	
14	B ✓	1	1.1	
15	B ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	Lipase✓ Fatty acids ✓ Glycerol ✓	3	3 x 2.1	**ALLOW** enzyme
		(ii)	Curve that goes up (and down) ✓ Curve that shows peak/maximum in alkaline pH ✓	2	2 x 2.1	 **ALLOW** any pH peak/maximum greater than 7
	(b)		**Independent variable (max 2)** • Change the temperature ✓ • Method of maintaining/changing the temperature e.g. water bath/Bunsen burner ✓ **Observations to be made (max 2)** • Record the time it takes (for the indicator) to change colour ✓ • To colourless ✓ • Ref to use of a stop clock ✓ **Variables to be controlled (max 2)** • Volume/mass of milk ✓ • Concentration of enzyme ✓ • Volume/mass of enzyme ✓ • Type of milk ✓	5	5 x 3.3a	Marks can be credited if scored in the incorrect section as long as the explanation is clear **IGNORE** heater **ALLOW** see which flask turns colourless first = 2 **IGNORE** amount/quantity throughout **ALLOW** use the same milk **DO NOT ALLOW** temperature

Question			Answer	Marks	AO element	Guidance

Question			Answer	Marks	AO element	Guidance
17	(a)	(i)	All 3 bars correctly drawn ✓ Both scales correctly completed ✓	2	2 x 2.2	**ALLOW** +/- ½ small square **ALLOW** correct heights even without scale on Y axis **IGNORE** absence of 'tick' marks on axis if scale is clear **IGNORE** width of bar
		(ii)	3 of the (six) readings are over 30 / half/50% of the readings are over 30 ✓	1	1 x 3.2a	**ALLOW** the named three months **IGNORE** only two months stated **ALLOW** the mean reading is over 30
		(iii)	**Any two from:** Idea that needs to take readings over a longer time ✓ Readings need to be more consistent/less fluctuations ✓ Readings could be more precise (not rounded) ✓ Measure progesterone/LH/oestrogen levels ✓ Some measure of the frequency/change of periods ✓	2	2 x 3.3a	**IGNORE** just more readings **IGNORE** reference to hot flushes / mood swings / bone strength
	(b)		**Any three from:** It depends how bad her symptoms are / if she has hot flushes/mood swings/weak bones / idea that it reduces the symptoms of menopause ✓	3	3 x 3.1a	

Question			Answer	Marks	AO element	Guidance
			She needs to balance up the benefits versus risks ✓ HRT would reduce the risk of her bones breaking / it would maintain the strength of her bones ✓ She is under 60, so no increased risk from heart disease ✓ She is overweight, so has increased risk of blood clots✓ She should try to lose weight ✓ Increased risk of breast cancer if she takes it long term/for longer than a year ✓			**IGNORE** references to weak bones unqualified **ALLOW** she is close to 60 so she will soon be at greater risk from heart disease **ALLOW** use HRT but try not to take it for more than 1 year **ALLOW** if there is a family history of breast cancer

Question			Answer	Marks	AO element	Guidance
18	(a)		The dandelion stem bends/grows upwards ✓ The response is negatively geotropic/gravitropic / the stem grows away from gravity ✓ Auxin gathers on/diffuses/passes to the lower side of the stem ✓ Causes (more) cell elongation (on the lower side of the stem) ✓	4	4 x 2.2	**ALLOW** there is an increase in upward movement **DO NOT ALLOW** reference to phototropism/bending towards the light **ALLOW** plant instead of stem **IGNORE** auxins are (produced) on the lower side
	(b)		Take measurements at smaller time intervals/more frequently ✓ (It reaches 90°) anytime between 5 and 6 hours ✓	2	2 x 3.3b	**ALLOW** use of a video/timelapse **IGNORE** use minutes instead of hours **ALLOW** near to 6 hours
	(c)		Break seed dormancy / elongation of shoots/cells ✓	1	1 X 1.1	**ALLOW** flowering / fruit development / fruit growth / seed formation / germination / growth of shoots / produces seedless fruits **DO NOT ALLOW** fruit ripening **IGNORE** breaks dormancy unqualified

Question			Answer	Marks	AO element	Guidance
19	(a)		Retina is light sensitive/is where the receptors are found/is where the image is formed ✓ If damaged it may not detect light/the image ✓	2	1 x 1.1 1 x 2.1	**ALLOW** retina is where the light is focussed **ALLOW** idea that information about the image would not be able to be sent to the brain **IGNORE** if damaged, the image will not form
	(b)		Capillary ✓	1	1 x 1.1	
	(c)	(i)	**Any two from:** Sample size is very small / only two patients were tested ✓ Idea that the experiment showed an improvement not a cure ✓ (Only 1 year later,) eyesight could deteriorate in subsequent years ✓ Have not tested it on dry AMD / may not work on all forms of blindness / only one form of blindness was tested ✓	2	2 x 3.1a	**ALLOW** reference to possible long term side effects
		(ii)	Test more people / See if it cures dry AMD / See if it is safe/has side effects / See if it lasts long term / Determine the cost /	1	1 x 3.1a	**IGNORE** reference to age **IGNORE** reference to the damage increasing **ALLOW** possible named side effect

Question			Answer	Marks	AO element	Guidance
			Determine the availability of the stem cells ✓			

Question			Answer	Marks	AO element	Guidance
20	(a)		Thyroid releases thyroxine which regulates the body's metabolic rate ✓ Affects the amount of heat that will be generated/produced ✓	2	1 x 1.1 1 X 2.1	**IGNORE** reference to respiration rate/heart rate/breathing rate **DO NOT ALLOW** reduces the production of energy **IGNORE** reduces the release of energy **ALLOW** idea that it stimulates exothermic reactions
	(b)		**Any two from:** Reduces blood flow to the heart muscle/cells ✓ Less oxygen/glucose delivered to the heart muscle/cells ✓ Heart (muscle) respires less ✓ Heart (muscle) does not contract properly ✓	2	2 x 2.1	**IGNORE** Reduces blood flow to the heart **IGNORE** Less oxygen/glucose delivered to the heart
	(c)		**Any three from:** Affects enzymes ✓ Stops/decreases the rate of reactions ✓ Metabolism/respiration/digestion slows down/stops ✓ Reduced blood flow to the extremities / frostbite ✓	3	3 x 1.1	**DO NOT ALLOW** denatures enzymes Enzyme controlled reactions are too slow = 2 marks
	(d)		**First check answer on answer line.** **If answer = 1.36 million award 2 mark** 68÷100 = 0.68 ✓	2	2 x 2.1	**ALLOW** 68 x 0.02 ✓

Question			Answer	Marks	AO element	Guidance
			0.68 X 2 = 1.36 ✓			One mark for 1 360 000
	(e)		Adrenaline ✓	**1**	**1 x 1.1**	

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	**Any two from:** A process occurring in all cells/in mitochondria ✓ Breakdown/use of glucose to release/transfer/provide energy ✓ Producing ATP ✓	2	2 x 1.1	**DO NOT ALLOW** produces energy **IGNORE** reference to the use of oxygen **ALLOW** energy stored as ATP Second or third marking points can be awarded from an equation if it shows energy or ATP
		(ii)	Ratio = 0.9 ✓ Glucose and protein ✓	2	1 x 1.2 1 x 3.1	Need to have the correct ratio to score the second marking point **ALLOW** glucose, protein, and lipid **ALLOW** glucose and lipid
	(b)	(i)	Use/add Benedict's (reagent) ✓ Heat ✓	2	2 x 1.2	**IGNORE** references to colour changes
		(ii)	Idea that less colour change/less red colour/less precipitate indicates less glucose present ✓	1	1 x 2.2	**ALLOW** idea that small amount of glucose only produces a green colour **ALLOW** idea of the use of a colour scale to judge how much glucose is present **ALLOW** reverse argument **IGNORE** reference to time taken to change colour **IGNORE** see how dark/light the indicator becomes unless qualified by colours

Question			Answer	Marks	AO element	Guidance
22	(a)		Water potential of cytoplasm/cells is low/is reduced ✓ Water moves into guard cells by osmosis ✓ Guard cells have an unevenly thickened wall ✓ Guard cells bend to open the stoma ✓	4	1 x 2.1 1 x 1.1 1 x 2.1 1 x 1.1	**ALLOW** the cells are hypertonic/more concentrated Must be clear that water is not entering the guard cells through the stoma **DO NOT ALLOW** water and ions enter by osmosis **ALLOW** reverse argument for each marking point if answer refers to stomata closing
	(b)		**First check answer on answer line.** **If answer = 12.5 award 2 marks** 5 ÷ 400 = 0.0125 ✓ 0.0125 x 1000 = 12.5 ✓	2	2 x 2.2	 **ALLOW** a mark for a correct conversion by x1000
	(c)		Transports sugars ✓ Up and down ✓	2	2 x 1.1	**ALLOW** transports water/mineral ions **ALLOW** transports one way/upwards Mark both lines together. If more than two reasons are given, then every wrong reason negates a correct reason.

Question			Answer	Marks	AO element	Guidance
23	(a)		CA(E) ✓ DB ✓	2	2 x 1.1	
	(b)		**Any two from:** Each triplet/3 bases/codon codes for one amino acid✓ The order of the triplet codes determines the sequence of amino acids ✓ The sequence of amino acids determines protein structure/which protein is made ✓	2	2 x 1.1	**DO NOT ALLOW** codes for the production of amino acids / forms different amino acids **ALLOW** order of bases determines the sequence of amino acids
	(c)	(i)	A different order of the amino acids would result ✓ Different proteins have different orders of amino acids / the protein would have a different shape/structure ✓	2	2 x 2.1	**DO NOT ALLOW** idea that each section would now code for a different amino acid **DO NOT ALLOW** codes for the production of different amino acids **DO NOT ALLOW** the idea that amino acids code for proteins
		(ii)	6✓	1	1 x 1.2	
	(d)		**Any three from:** In eukaryotes it is contained in the nucleus ✓ In prokaryotes it is in the cytoplasm ✓ In eukaryotes it/DNA/chromosome is a strand but in prokaryotes it is a loop/circle/ring ✓ Prokaryotes have plasmids / eukaryotes do not have plasmids ✓	3	3 X 1.1	

Question			Answer	Marks	AO element	Guidance
			In both it is made of the same component parts/base, sugar and phosphate/nucleotides✓			

Question			Answer	Marks	AO element	Guidance
24	(a)		Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Describes the general role of stem cells **AND** Describes the development of red blood cells as specialised cells **AND** Explains the change in RNA concentration **or** the loss of the nucleus *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Describes the general role of stem cells **and** describes the development of red blood cells as specialised cells **OR** Describes the development of red blood cells as specialised cells **and** explains the change in RNA concentration **or** the loss of the nucleus **OR** Describes the general role of stem cells **and** explains the change in RNA concentration **or** the loss of the nucleus *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Describes the general role of stem cells **OR**	**6**	**2 x 1.1** **3 x 2.1** **1 x 3.2b**	**AO1 Demonstrate knowledge and understanding of scientific ideas of the general role of stem cells.** • Stem cells are undifferentiated cells/are able to differentiate to form different cells • Stem cells become specialised for specific functions/become specialised cells **AO2 Apply knowledge and understanding of scientific ideas to the development of the red blood cell from a stem cell to a cell that contains the protein haemoglobin.** • Red blood cells (are specialised cells as they) - do not have a nucleus - contain haemoglobin • Haemoglobin is made by protein synthesis/by using RNA **AO3 Analyse information from the graph to explain changes that occur to RNA and the loss of the nucleus** • Amount of RNA falls due to the loss/decrease in size of the nucleus • The cell loses the nucleus to give room for large amounts of haemoglobin that have been produced

Question			Answer	Marks	AO element	Guidance
			Describes the development of red blood cells as specialised cells **OR** Explains the change in RNA concentration **or** the loss of the nucleus *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*			
	(b)		**First check answer on answer line.** **If answer =** 2.115×10^{13} **award 3 marks** correct multiplication of 4.7 x 4.5 appearing in the working ✓ multiplication of x 1 000 000 appearing twice in the working / answer multiplied by 10^{12}✓ $4.7 \times 4.5 \times 10^{12} = 2.115 \times 10^{13}$ ✓	**3**	**3 x 2.2**	**ALLOW** any correct rounding of 2.115×10^{13} **ALLOW** one mark for an incorrect answer if it is clearly shown that it has been correctly converted into standard form

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