

OCR • GCSE BIOLOGY J247

Higher Tier — Paper 4

June 2024 exam series

MARK SCHEME

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Higher

GCSE

Biology A Gateway

J247/04: Paper 4 (Higher Tier)

General Certificate of Secondary Education

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. **Crossed Out Responses**
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 the annotation 'SEEN' 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 question on this paper is **18(d)**.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

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

12. 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 A:

	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	1.1	
3	D	1	1.1	
4	B	1	1.1	
5	B	1	1.1	
6	B	1	2.1	ALLOW 4
7	D	1	1.1	
8	B	1	1.2	
9	A	1	2.1	
10	A	1	1.1	
11	B	1	2.1	
12	D	1	1.1	
13	A	1	1.1	
14	C	1	2.2	
15	C	1	1.1	

Question			Answer	Marks	AO element	Guidance
16	(a)		Two / 2 ✓	1	2.1	IGNORE lizard and frog
	(b)		(Idea they are Predators) because they hunt/eat the racers/snake ✓ (Idea they are competitors because) they both feed on lizards / eat the same food ✓	2	2 x 2.1	ALLOW racers are its prey IGNORE predators of snakes/racers ALLOW they are both predators of lizards DO NOT ALLOW both feed on lizards and frogs
	(c)		Egestion and respiration ✓	1	1.1	
	(d)	(i)	Biological control ✓	1	1.1	
		(ii)	Idea Mongooses produce more offspring and would eat/predate the racer/snake ✓	1	2.1	ALLOW mongooses produce more offspring and eat the racer's/snake food/lizard ALLOW mongooses produce more offspring and outcompete the snake ALLOW mongoose produce 9 offspring where snake produces 5 / 4 more offspring to eat the snake/racer
	(e)	(i)	(The snakes survived because) there was no/less mongoose/predator ✓	1	3.1b	ALLOW no/less competition / not/less eaten by the mongoose
		(ii)	Any two from: Mongoose could reach the island ✓ They could eat/hunt/kill/predate/the remaining snakes ✓ (Tourists) could destroy habitat/poach/eat/hunt/kill/predate snake ✓ Introduce disease/pathogens ✓	2	2 x 3.1b	ALLOW predators / new predators ALLOW idea predator/tourists would eat snakes' food IGNORE snakes become extinct/endangered ALLOW e.g., tourists litter the island

Question			Answer	Marks	AO element	Guidance
17	(a)		Antibiotics are used inside the body, but antiseptics are not ✓	1	1.1	DO NOT ALLOW more than one box ticked
	(b)	(i)	Use a wire / (inoculating) loop / pour liquid culture over the agar ✓ Lift lid of Petri dish slightly / sterilise (wire) ✓	2	2 x 1.2	ALLOW pour solution with bacteria over the agar ALLOW use a spreader / rod / swab / pipette / cotton buds ALLOW idea of aseptic technique ALLOW ECF for incorrect named wire/loop
		(ii)	Allow oxygen to enter the dish / prevent anaerobic conditions ✓ Stop pathogens/harmful bacteria growing/reproducing/created / Otherwise, pathogens/harmful bacteria could grow/reproduce/create ✓ OR Stops oxygen to enter the dish / anaerobic conditions ✓ Pathogens/harmful bacteria grow/reproduce ✓	2	2 x 1.2	ALLOW (for bacteria) to carry out aerobic respiration ALLOW stop anaerobic bacteria from growing = 2 ALLOW bacteria need oxygen to carry out aerobic respiration = 2 (lack of oxygen, bacteria) can't carry out aerobic respiration bacteria ALLOW anaerobic bacteria can grow = 2 ALLOW bacteria can't get oxygen which is needed for aerobic respiration = 2
	(c)	(i)	Idea that B is the most effective/killed the most/removed all the bacteria ✓ Idea C is the least effective/killed/removed the least bacteria ✓	2	2 x 3.2b	IGNORE references to petri dish A ALLOW B is more efficient than C/D (at killing bacteria) ALLOW D is more efficient than C (at killing bacteria) Correct order of efficiency (of killing bacteria) is B → D → C = two marks IGNORE strongest/weakest

Question			Answer	Marks	AO element	Guidance
		(ii)	Any two from: Using different concentrations/volume of disinfectant / make each disinfectant more dilute ✓ Using different concentrations/amounts of bacteria ✓ Using different types of bacteria ✓	2	2 x 3.3b	IGNORE amount IGNORE stronger bacteria ALLOW repeat for one mark if no marks are awarded IGNORE reference to time

Question			Answer	Marks	AO element	Guidance
18	(a)	(i)	First check the answer on the answer line If answer = (-)69 (%) award 3 marks $(900\,000 \div 1\,300\,000) \times 100 \checkmark$ 69.23077(%) $\checkmark$ (-)69 (%) $\checkmark$	3	2 x 2.2 1.2	ALLOW $(0.9 \div 1.3) \times 100$ ALLOW any correct calculating method ALLOW any correct rounding of 69.2307692 for 2 marks ALLOW one mark for clear evidence of an incorrect answer correctly rounded to 2 significant figures
	(b)		Dropping at a decreasing rate $\checkmark$	1	2.2	DO NOT ALLOW more than one box ticked
	(c)	(i)	Idea to see (threatened) habitats/(endangered) species/ecosystems/nature $\checkmark$ To raise money/employment/profit/donation $\checkmark$	2	2 x 1.1	ALLOW in a way that will not damage / conserve the habitat/species/environment/biodiversity ALLOW education

Question			Answer	Marks	AO element	Guidance
		(ii)	Culling: Pain / cruel / unethical ✓ Relocation: Expensive/logistic/difficult/problematic to transport the elephants / elephants might be distressed/split up families ✓ Contraception: May have harmful side effects on the elephants / may not be able to reproduce again / population would be aging / ✓	3	3 x 2.1	ALLOW controversial ALLOW elephants could be hunted / may try and return to area / spread disease / eat crops in the new location IGNORE not adapted to new location/disrupt food chains/not survive ALLOW reduces number of breeding females / permanent effects on fertility ALLOW numbers drop too low/extinction if the elephants are not reproducing/less offspring.
		(iii)	This method is not swallowed/orally/ingested / the (contraceptive) pill is taken orally/swallowed OR This method does not use hormones / (contraceptive) pill uses hormones OR This method allows egg to mature/release/ovulation / contraceptive pill prevents egg maturing/release/ovulation ✓	1	2.1	AW female humans for contraceptive pill ALLOW Pill contains oestrogen/progesterone / pill decreases FSH/LH ALLOW (contraceptive) pill thickens mucus/uterus lining doesn't become as thick IGNORE references to lack of fertilisation IGNORE period/menstruation

Question		Answer	Marks	AO element	Guidance
	(d)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) Detailed explanation why the number of tuskless elephants is rapidly increasing in East Africa using ideas of both inheritance and natural selection. AND Explains why the spread of this allele may have negative effects on the elephant population <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Explanation why the number of tuskless elephants is rapidly increasing in East Africa using ideas from either inheritance or natural selection. AND Explains why the spread of this allele may have negative effects on the elephant population <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Explanation why the number of tuskless elephants is rapidly increasing in East Africa using ideas from either inheritance or natural selection. OR Explains why the spread of this allele may have negative effects on the elephant population	6	2 x 1.1 2 x 2.1 2 x 3.2a	AO1.1 Demonstrates knowledge and understanding of scientific ideas to explain the significance of the allele being dominant. Inheritance: - Dominant allele is always expressed if present Only one tuskless allele needed to give phenotype/for elephant to be tuskless AO2.1 Applies knowledge and understanding to explain why the proportion of tuskless elephants are increasing. Inheritance: 50% chance of offspring inheriting this allele (if mother is tuskless) 50% chance of female elephants born with tusks (if mother is tuskless) - only females born tuskless 100% of male elephants born with tusks / 0% male elephants born with no tusks (if inherit dominant allele) - Males can only survive as homozygous recessive - Accept correct Punnett square showing heterozygous x homozygous recessive Natural selection: - Tuskless elephants are less likely to be hunted ORA - The tuskless elephants are more likely to survive and breed ORA - The allele for tuskless is more likely to be passed on ORA - The frequency of the tuskless allele will increase in the population over time - No males born without tusks

Question			Answer	Marks	AO element	Guidance
			<i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>			AO3.2a Analyses information to explain why the spread of the allele may have negative effects. • (The allele is lethal to male embryos) so fewer male elephants will be born/male population will fall • This will cause the number of males to females in the population to be unbalanced • Female elephants may find it harder to find a mate • More males hunted with tusks so less males • (Female) elephants will not be able to defend themselves without tusks. • Idea tusks are used to access food

Question			Answer	Marks	AO element	Guidance
19	(a)		Host ✓	1	1.1	DO NOT ALLOW more than one circled answer
	(b)		Gains sugars (from the tree/phloem) ✓ Sugar is transported in the phloem ✓	2	2.1 1.1	ALLOW all named sugars ALLOW mistletoe makes less sugar/glucose IGNORE nutrients DO NOT ALLOW minerals/ions ALLOW translocation of sugars in phloem IGNORE minerals
	(c)	(i)	(Radioactive) carbon dioxide/carbon is used by the <u>tree</u> in photosynthesis ✓ (The radioactive) carbon/carbon dioxide is trapped/converted/made/turned into sugar/glucose (in the tree)	2	1.1 2.1	DO NOT ALLOW oxygen needed for photosynthesis DO NOT ALLOW references to mistletoe/it/plants using radioactive carbon dioxide/carbon in photosynthesis DO NOT ALLOW references to mistletoe/it/plants using (radioactive) carbon dioxide/carbon to make sugar/glucose
		(ii)	Lower/less chlorophyll/dwarf mistletoe (content) has higher percentage/more of radioactive sugar ✓ Less chlorophyll to produce/make sugar/glucose/photosynthesise ✓ More sugar needed/taken from tree ✓	3	3 x 3.2a	IGNORE simple quoting of data ALLOW ORA AW radioactive carbon/carbon dioxide for sugar ORA for Eastern mistletoe/more chlorophyll ORA for Eastern mistletoe/more chlorophyll IGNORE ATP

Question			Answer	Marks	AO element	Guidance
20	(a)		Lactic acid alters/lowers pH ✓ To measure the speed/rate of decomposition/decay ✓	2	2 x 2.2	ALLOW measure rate/speed of enzyme activity
	(b)		Any three from: Draw a line/scatter graph ✓ Put time on the x axis ✓ Put pH on the y axis ✓ Draw three lines, one for each temperature ✓	3	3 x 2.2	ALLOW sketched graph showing the correct marking points DO NOT ALLOW bar chart/histogram DO NOT ALLOW temperature on either axis ALLOW hrs on x axis ALLOW separate colours/key for each temperature IGNORE line of best fit ALLOW time and pH alone but not stated which axis for max 1 mark if no marks awarded
	(c)		(Increasing the temperature) will increase decay/decomposition ✓ (Increase in temperature) increases the kinetic energy ✓ (increase in temperature) more collisions ✓	3	1 x 2.2 1 x 3.1a 1 x 3.1a	ALLOW (increasing the temperature) will increase conversion of sugar into lactic acid DO NOT ALLOW decay stops at high temperatures ALLOW increase energy to move around / move faster IGNORE more energy ALLOW more enzyme substrate complexes
	(d)		The milk would not decompose / pH would not fall /change✓ Bacteria would be killed / enzymes denatured / active site changes shape and substrate will not fit ✓	2	2 x 3.3a	ALLOW pH will be 6.5 / sugar can't convert into lactic acid IGNORE slows down decay/pH falls slower

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	Any two from: Cause mutations/change DNA/genes ✓ Rapid/uncontrolled (cell) division ✓ Form tumours ✓	2	2 x 1.1	AW cell replication/multiplication/mitosis IGNORE reproduction/uncontrolled growth IGNORE spread to surrounding tissue
		(ii)	Idea results in humans might be different/ only tested on animals ✓	1	2.1	IGNORE humans eat toast with no effects / humans have not been tested
	(b)	(i)	Any two from: Longer heating/dark toast produces highest concentration/more acrylamide ✓ Toast made from potato has the most acrylamide ✓ The concentration of acrylamide in light coloured toast is very similar/same as untoasted bread ✓ Heating/as bread darkens wheat has the least increase in acrylamide ✓	2	2 x 3.2b	AW concentration for acrylamide ALLOW as toasting increases, acrylamide increases ALLOW untoasted and light rye make the least acrylamide ALLOW lightly toasted has no effect on acrylamide ALLOW any other correct conclusion between wheat and rye qualified
		(ii)	First check the answer on the answer line If answer = 6 award 3 marks (Dark potato toast =) 600 (mg/kg) ✓ (One slice has) 30 (mg) ✓ Maximum = 6 slices ✓	3	3 x 2.2	Answer of 6.5 slices = 2 marks
		(iii)	Idea that they would not be able to judge the colour of the toast in the same way / colours are subjective ✓	1	2.2	ALLOW do not know how long to heat for to get the colours IGNORE do not know how long to heat the bread unqualified

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	Non-coding DNA ✓ Transcription ✓ Ribosomes ✓ Translation ✓	4	4 x 1.1	
		(ii)	(Genetic engineering) introduce a gene from another organism ORA ✓	1	1.1	AW adding/transfer/insert for introduce IGNORE change/replace genes/DNA from another organism ALLOW only uses gene from one organism

Question			Answer	Marks	AO element	Guidance
22	(a)		First check the answer on the answer line If answer = 7920 award 2 marks $\frac{66\,000\,000 \times 12}{100\,000}$ OR $66\,000\,000 / 100\,000 \times 12 \checkmark$ $= 7920 \checkmark$	2	2.2 1.2	ALLOW any correct calculating method ALLOW 660
	(b)		(Huntington's) prevents/reduces the cerebrum/brain sending impulses (to move the legs) ✓ (MD) cannot contract muscles/effectors (to move the legs) ✓ (SMA) prevents/less impulses being carried by motor neurones ✓	3	3 x 2.1	AW signals throughout ALLOW spinal cord can receive less impulses ALLOW brain sends impulses to spinal cord ALLOW muscles contract to move legs ALLOW prevents/less impulses reaching muscles/effectors ALLOW motor neurones send impulses to muscles/effectors

Question		Answer	Marks	AO element	Guidance
	(c)	Huntington's/dominant as it produces a protein and MD & SMA/recessive because it doesn't produce a protein (that causes the disease) ✓ AND Only one affected allele would cause the disease in Huntington's ✓ OR Both alleles would need to be affected to have the disorder in MD & SMA ✓	2	2 x 2.1	ALLOW only need one (affected) allele to be expressed when it is dominant. ALLOW need both (affected) alleles to be expressed when it is recessive
	(d)	Any two from: Rejection (of cells) ✓ New cells would be damaged again by protein/not work ✓ Cells could mutate and become cancerous/form tumours ✓ Open to Infection/disease ✓	2	2 x 1.1	AW immune response ALLOW immunocompromised / immunosuppression / weakened immune system / transfer virus IGNORE unknown long-term effects / ethical issues

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