Higher

GCSE

Combined Science Biology A Gateway Science

J250/08: Paper 8 (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 **15(a)**.

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 Combined Science 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	D	1	2.1	
2	A	1	1.1	
3	D	1	1.1	
4	B	1	1.1	
5	C	1	1.1	
6	B	1	1.1	
7	B	1	2.1	
8	C	1	2.2	
9	B	1	1.1	
10	A	1	1.1	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>11</td><td>(a)</td><td>(i)</td><td>Suitable scale on Y axis ✓

Y axis labelled with units ✓

Accurate bars drawn ✓

Clear indication of which bars are which ✓</td><td>4</td><td>4 x 2.2</td><td>Place ticks and crosses on right hand side of grid

Minimum 50% of grid used
Scale must be in ascending order and linear
ALLOW the use of an axis break

Labels are:
Mass of insects (trapped) g

ALLOW + or – half square
Bars must be same width
ALLOW touching bars within the month but DO NOT ALLOW bars for different months touching
ALLOW stacked bar chart 500, 640, 1080, 530, 120

<table><tr><th rowspan="2">Month</th><th colspan="2">Mass of insects trapped (g)</th></tr><tr><th>1995</th><th>2015</th></tr><tr><td>May</td><td>450</td><td>50</td></tr><tr><td>June</td><td>520</td><td>120</td></tr><tr><td>July</td><td>920</td><td>160</td></tr><tr><td>August</td><td>420</td><td>110</td></tr><tr><td>September</td><td>100</td><td>20</td></tr></table></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Mass/it has decreased (from 1995 to 2015) / mass/it is greater (in 1995) ✓

Pattern across months is the same ✓</td><td>2</td><td>2 x 3.2b</td><td>IGNORE reference to differences in the numbers/populations of insects

ALLOW comparison of months e.g. highest mass is July for both years. Must refer to both years
ALLOW reference to comparisons in the patterns of numbers/population of insects</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
		(iii)	Record the number of different species found in the nets ✓	1	3.3a	
	(b)	(i)	**Any one from:** Idea that mark must not make it more visible to predators ✓ Idea that mark should not be toxic or poisonous (to the insect) ✓	1	2.2	**ALLOW** mark not visible to predators / doesn't make it more likely they get eaten by predators / do not use bright ink **DO NOT ALLOW** so it is visible **BUT ALLOW** only visible under UV light **IGNORE** make sure it is marked in the same place **ALLOW** does not cause harm (to the insect / predator) **IGNORE** does not affect (the insect) **IGNORE** not too much paint or ink / different colours **ALLOW** answers in terms of questions e.g. will it make it visible to predators? will it harm the insect?
		(ii)	**First check the answer on the answer line** **If answer = 1530 award 2 marks** $\frac{146 \times 63}{6}$ or 1533 ✓ = 1530 (3 sig. figs) ✓	2	2 x 2.2	**ALLOW** clear evidence of correct conversion of incorrect answer to 3 significant figures from a reasonable calculation
	(c)		False False True True ✓✓	2	2 x 3.1a	All correct = 2 marks Three correct = 1 mark Two or one correct = 0 marks

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>12</td><td>(a)</td><td></td><td>Eukaryotic cells (have chromosomes/genetic material) in a nucleus ✓

Prokaryotic cells (genetic material) in cytoplasm ✓</td><td>2</td><td>2 x 1.1</td><td>ALLOW prokaryotic cells have plasmids / loop of DNA/genetic material
ALLOW prokaryotic cells have (free) floating DNA/ have (free) floating genetic material
IGNORE plasma

ALLOW both made from DNA as an additional marking point</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Recessive ✓

Green and heterozygous ✓</td><td>2</td><td>2 x 2.1</td><td>IGNORE light/dark
IGNORE dominant/recessive</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Both genetic crosses correct ✓</td><td>3</td><td>3 x 2.1</td><td>yellow pods
<table>
<tr><td></td><td></td><td>g</td><td>g</td></tr>
<tr><td>green</td><td>G</td><td>Gg</td><td>Gg</td></tr>
<tr><td>pods</td><td>G</td><td>Gg</td><td>Gg</td></tr>
</table>
yellow pods
<table>
<tr><td></td><td></td><td>g</td><td>g</td></tr>
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<tr><td>pods</td><td>g</td><td>gg</td><td>gg</td></tr>
</table></td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
			Answer is dependent on first genetic cross Homozygous genotype offspring ratio = 4 : 0 ✓ **Answer is dependent on second genetic cross** Not homozygous genotype offspring ratio = 1 : 1 ✓			**ALLOW** <u>all</u> green / 1:0 / 18:0 **ALLOW** 0:1 / 0:18 / 0:4 unless colours incorrectly stated **ALLOW ECF** from their genetic cross **IGNORE** percentages **ALLOW** 2:2 / 9:9 / 50:50 **ALLOW ECF** from their genetic cross **IGNORE** percentages
		(iii)	Sample size too small ✓	**1**	**2.1**	**ALLOW** each individual cross has a random result

Question			Answer	Marks	AO element	Guidance
13	(a)		Spores / fungus ✓ Travels in wind ✓	2	2 x 1.1	 **ALLOW** examples of transfer by humans/animals/insects e.g. on gardening gloves/tools **ALLOW** travels in the air / direct contact between plants (shoots) / spread by rain **IGNORE** soil/water **DO NOT ALLOW** inherited
	(b)			3		NOTE the idea of 'less' or 'reduced' must be seen once in the answer to gain 3 marks
			Reduces the rate of photosynthesis ✓		2.1	**ALLOW** chloroplast is the site for photosynthesis **ALLOW** cannot trap enough sunlight energy (for photosynthesis) **DO NOT ALLOW** chloroplast is the site for respiration
			Photosynthesis produces (less) oxygen/glucose ✓		1.1	**ALLOW** no glucose produced **ALLOW** correct word or symbol equation for photosynthesis **DO NOT ALLOW** less carbon dioxide is produced
			Idea that glucose is needed for respiration ✓		1.1	**ALLOW** idea that oxygen is needed for respiration **ALLOW** correct word or symbol equation for respiration
	(c)	(i)	Restriction ✓ Ligase ✓ Antibiotic resistance markers ✓	3	3 x 1.1	 **DO NOT ALLOW** lipase **ALLOW** marker gene **ALLOW** idea of using antibiotics to see if they affect bacteria, those unaffected contain the gene

Question			Answer	Marks	AO element	Guidance
						IGNORE antibacterial **IGNORE** restriction marker **DO NOT ALLOW** resistant antibody marker
		(ii)	**Any two from:** Enzyme denatures ✓ Active site/enzyme changes shape ✓ Substrate would no longer fit into / bind to / be complementary to the active site ✓	**2**	**2 x 1.1**	 **ALLOW** active site denatures **ALLOW** enzyme is deformed/unravels **ALLOW** DNA for substrate **ALLOW** no enzyme substrates formed NOTE shape of the active site is no longer complementary to its substrate = 2
	(d)		**Any two from:** Idea that chemicals are toxic / would harm/kill other species / may reduce the number of pollinators ✓ Idea that chemicals may reduce food source for animals higher in food chain ✓	**2**	**2 x 2.1**	 **ALLOW ORA** **ALLOW** named pollinator **IGNORE** reference to humans **ALLOW** prevents bioaccumulation / description of bioaccumulation **IGNORE** ideas about cost **IGNORE** ideas that plants may develop resistance

Question			Answer	Marks	AO element	Guidance
14	(a)	(i)	**First check the answer in table or answer space** **If answer = 3.96 award 3 marks** 5.0 x 100 126.3 ✓ = 3.9588281 ✓ = 3.96 ✓	**3**	**1.1** **2 x 2.2**	**ALLOW** 121.3 -126.3 x 100 126.3 **OR** 126.3 -121.3 x 100 126.3 **ALLOW ECF** from an incorrect difference in mass **ALLOW ECF** from incorrect mass of soil i.e. 121.3 or 247.6 **ALLOW** 2 marks for 3.95882…. **ALLOW** evidence of correct rounding from reasonable calculation **ALLOW** 2 marks for 4.12 **IGNORE** % sign in the body of the table
		(ii)	(Sample **A**) had less mass (at the start) ✓	**1**	**3.1a**	Assume answers refer to sample **A** unless **B** stated **ALLOW** there is less soil/weighed less (at the start) **ALLOW** sample **B** had more mass/more soil (at the start) **IGNORE** reference to numbers

Question			Answer	Marks	AO element	Guidance
		(iii)	(Y) kept (sample C) in the oven for longer ✓ More moisture is given off / soil in student X's experiment still contained water ✓	**2**	**2 x 3.1b**	Assume answers refer to **Y** unless **X** stated
		(iv)	Leave sample in the oven until the mass does not change ✓	**1**	**3.3b**	**ALLOW** repeat experiment with longer time **ALLOW** Use a moisture level probe

	(b)		**Any three from:** Required for decomposition/decomposers ✓ Return minerals/nitrogen/nitrogen compounds (to the soil) ✓ Minerals/nitrogen/nitrogen compounds needed to make proteins / amino acids ✓ Proteins are needed for growth ✓	**3**	**3 x 1.1**	**ALLOW** description of breaking down dead/organic matter / decay / rot **IGNORE** soil microorganisms die **and** decompose **IGNORE** nutrients **ALLOW** recycle/provide minerals/nitrogen/nitrogen compounds **ALLOW** provides or returns to the soil named mineral/nitrogen compound **IGNORE** nutrients **DO NOT ALLOW** provide energy for the plant **DO NOT ALLOW** other named nutrients needed for growth **ALLOW** 2 marks for break down urea into ammonia for MP1 and MP2 **Additional marking point** nitrogen fixing bacteria
	(c)		Microorganisms are living **and** (soil) moisture is a non-living/physical factor ✓	**1**	**1.1**	**ALLOW** microorganisms are living **and** (soil) moisture is not **ALLOW** biotic factors are living things **and** abiotic factors are not **ALLOW** water for soil moisture **IGNORE** environmental factor

Question			Answer	Marks	AO element	Guidance
15	(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)** Detailed explanation of evolution **AND** Detailed explanation of why they became extinct *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)** Detailed explanation of evolution **and** an attempt at an explanation of why they became extinct **OR** Detailed explanation of why they became extinct **and** an attempt at explanation of evolution **OR** A reasonable explanation of evolution **and** a reasonable explanation of why they became extinct *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)** Attempts explanation of evolution **OR** Attempts explanation of why they became extinct *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant*.	6	3 x 2.1 3 x 3.2a	**AO2.1 Apply knowledge and understanding to explain dodo evolution** • no predators so no need to fly • no advantage in being able to fly or nest in trees • variation in wing size / mutation caused smaller wings • because there were no predators the birds which had smaller wings survived and passed on that gene/feature • birds with smaller wings used less energy for flying and so reproduced more • genes/alleles (for smaller wings) passed on and became more frequent **ORA** • idea that dodos became a different species (from original pigeon) **IGNORE** just survival of fittest/natural selection **AO3.2a Analyse information and ideas to make judgments about extinction of dodo** • humans introduced animals that ate the dodo eggs/ are predators of the dodo / destroyed forests • animals/ humans destroyed nesting sites/ habitat • dodo could not escape predators as could not nest in / fly up to the trees • eggs eaten so no offspring • no offspring as dodo could not nest in trees to protect their eggs

Question			Answer	Marks	AO element	Guidance
			0 marks *No response or no response worthy of credit.*			• Idea that eggs were being destroyed faster / overhunted than the dodos could reproduce • animals introduced by humans out-competed dodos for food • not enough time for dodos to adapt to grow bigger wings / escape predators / nest in trees
	(b)		DNA / fossils ✓	**1**	**1.1**	**ALLOW** comparing bone structure

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