Foundation

GCSE

Combined Science Biology A Gateway Science

J250/08: Paper 8 (Higher Tier)

General Certificate of Secondary Education

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:

   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 the annotation SEEN 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 13.

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

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 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.

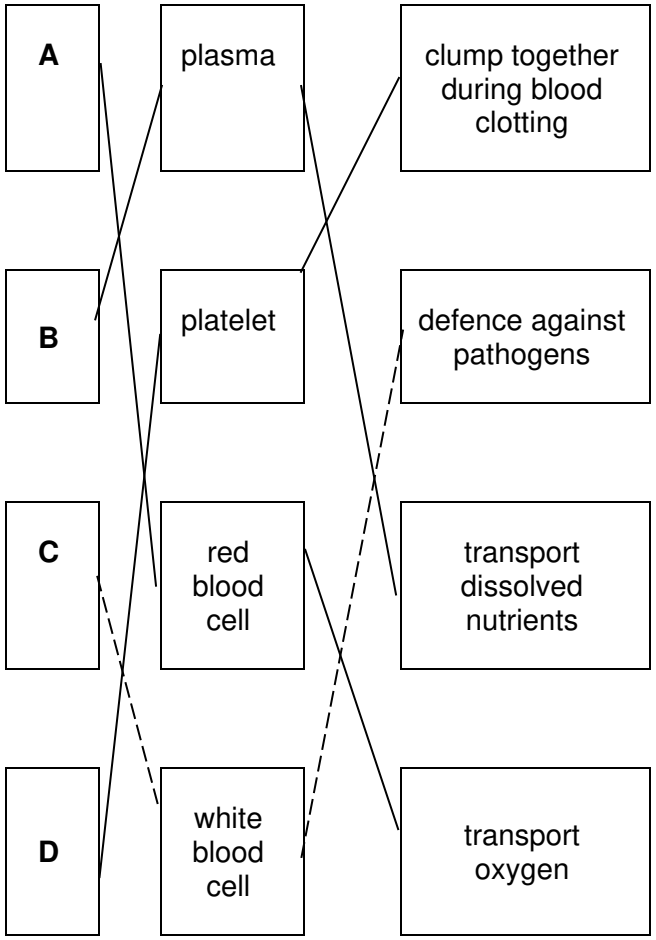
For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	A	1	1.2	
2	C	1	2.1	
3	C	1	1.1	
4	B	1	2.1	
5	C	1	1.1	
6	D	1	1.1	
7	C	1	2.1	
8	B	1	2.1	
9	A	1	2.1	
10	B	1	1.2	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	Red is <u>dominant</u> ✓ Idea that (all) offspring/they/red flowers have (one) red allele / Offspring/they/red flowers are Rr ✓	2	3.2a 3.2b	**ALLOW** white is <u>recessive</u> **IGNORE** it is dominant / R is dominant **IGNORE** references to parents' genes **ALLOW** (all) offspring/they/red flowers have (one) red gene **ALLOW** (all) offspring/they/red flowers are heterozygous **ALLOW** (all) offspring/they/red flowers inherited the red allele **ALLOW** mark from a correct genetic diagram <table><tr><td></td><td>R</td><td>R</td></tr><tr><td>r</td><td>Rr</td><td>Rr</td></tr><tr><td>r</td><td>Rr</td><td>Rr</td></tr></table> **IGNORE** offspring are not homozygous **ALLOW** for 2 marks offspring have the <u>dominant</u> red allele/gene = 2 marks
		(ii)	Different alleles (for a gene) ✓	1	1.1	**ALLOW** they have one dominant allele and one recessive allele **ALLOW** alleles are not the same / have R and r allele / they are Rr **ALLOW** two versions of the gene are different **IGNORE** have separate alleles / mixture of two alleles **IGNORE** two different genotypes **DO NOT ALLOW** different genes

	(b)		Correct alleles for parents ✓ Correct alleles for offspring ✓ Probability = 50(%) / ½ / 1 in 2 / 1:1 / $^{2}/_{4}$ ✓	**3**	**3 x 2.1**	**DO NOT ALLOW** other letters e.g., W **DO NOT ALLOW ECF** from incorrect parents **ALLOW ECF** from incorrect diagram Probability must be correct for cross shown in their Punnett square Homozygous white flower Heterozygous red flower **r** **r** **R** Rr Rr **r** rr rr
	(c)	**(i)**	**First check the answer on answer line** **If answer = 49(%) award 3 marks** Number of blue plants = 48 ✓ (48 ÷ 97 x 100) = 49.4845 ✓ = 49 ✓	**3**	**3 x 2.2**	49.5 / 49.4845 = 2 marks **ALLOW** one mark for evidence of correctly rounding their calculated value to whole number **ALLOW ECF** from evidence of incorrect reading of graph for max 2 marks e.g., (46 ÷ 97 x 100) = 47.422 = 47 = 2 marks e.g., 47 blue = 48.45 = 1 mark

		(ii)	Idea of no in-between values ✓	**1**	**3.1b**	**ALLOW** are (only) one colour / no different shades of colours / flowers can (only) be any of the five different colours / limited variety of colours / distinct/discrete categories / only be a select number of colours / data in groups / data in categories **ALLOW** it is a bar chart not a line/histogram / bars don't touch / it is a bar chart because only discontinuous data can be displayed this way
	(d)		Twice ✓ Mitosis ✓	**2**	**2 x 1.1**	Three rings two correct = 1 mark Three rings one correct = 0 marks More than three rings = 0 marks

Question			Answer	Marks	AO element	Guidance
12	(a)		 ✓✓✓	3	3 x 1.1	**IGNORE** C-white blood cell-defence All six lines correct = 3 marks Four or five correct = 2 marks Two or three correct = 1 mark One correct = 0 marks

Question			Answer	Marks	AO element	Guidance
	(b)		**Any two from:** Produce antibodies to bind to pathogens/antigens ✓ Change shape/flexible to <u>engulf</u> pathogens ✓ Produce enzymes to digest pathogens ✓	**2**	**2 x 1.1**	**ALLOW** named pathogen e.g., virus **ALLOW** produce antibodies/antitoxins to destroy pathogens / produce antibodies for (specific) antigens / produce antibodies to clump pathogens together / produce antitoxins to neutralise toxins (from pathogens) I**GNORE** fight pathogens **ALLOW** flexible to squeeze out of capillaries/blood vessels **DO NOT ALLOW** flexible walls to engulf pathogens **ALLOW** contain enzymes to digest/destroy pathogens **IGNORE** reference to memory cells / large surface area / reproduce quickly
	(c)	**(i)**	Idea needles may be contaminated with blood/body fluid ✓	**1**	**1.1**	**ALLOW** HIV is transmitted through blood/body fluids (on needle) **ALLOW** HIV/virus/pathogens/blood/body fluid maybe on needle **IGNORE** needle has cells/DNA/bacteria/disease on it

		(ii)	Idea that knowing you are infected may make you take (more) precautions to prevent the spread ✓	**1**	**2.1**	**ALLOW** specific references e.g., knowing you have the disease means you are (more) likely to use protection when having sex / able to tell someone who is treating you when injured so they can take precautions / if you know you can get treatment (which stops you infecting people) / prevent infected person unknowingly transmitting HIV / abstain from sex **IGNORE** if you know you can prevent the spread or protect others / if you know you could tell your partner (before having sex) **IGNORE** if you know you can isolate / you will know you do not have HIV
	(d)		**First check the answer on answer line** **If answer = 76(%) award 3 marks** 640 ÷ 840 x 100 ✓ = 76.1904… ✓ = 76 ✓	**3**	**3 x 2.1**	**ALLOW** (840-200=) 640 anywhere in answer for one mark **ALLOW ECF** from incorrect readings of graph for max 2 marks – calculation must use readings correctly $\frac{\text{value for 1995 - value for 2000}}{\text{value for 1995}}$ e.g. 610 ÷ 820 x 100 = 74.39 = 1 mark e.g. 610 ÷ 820 x 100 = 74.39 = 74 = 2 marks e.g. 660 ÷ 860 x 100 = 77 = 2 marks **ALLOW** one mark for evidence of correctly rounding their calculated value to 2SF **ALLOW** alternative method of calculation e.g. 100 – (200 ÷ 840 x 100) = 76 **IGNORE** –ve sign

Question			Answer	Marks	AO element	Guidance
13*			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)** Identifies crop **D** with explanation **AND** Demonstrates detailed knowledge of enzymes to explain why growth is prevented at pH.4.5 to include a description of denaturing to include references to <u>active site</u> and links denaturing of enzymes to reduced growth to include ideas about photosynthesis/respiration/metabolic reactions/active transport *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)** Identifies crop **D** with explanation **AND** Demonstrates some knowledge of enzymes that show understanding of denaturing **OR** Identifies crop **D** with explanation **AND** Links enzymes or growth to ideas about photosynthesis/respiration/metabolic reactions/active transport *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	**2 x 1.1** **2 x 2.1** **2 x 3.2b**	**AO3.2b Analyse information and ideas to evaluate and draw conclusions** • proposes crop **D** should be grown because it has the highest yield (at pH 4-4.9 or 4.5) • idea that only crop **D** would be economically viable / **ORA** **AO1.1 Demonstrates knowledge and understanding of scientific ideas on enzymes to explain why growth is prevented at pH.4.5** • enzymes (of other crops) denature (at/below pH 4.5 or 4-4.9) • shows understanding of denaturing e.g., enzymes change shape / enzyme cannot bind with substrate • detailed description of denaturing e.g., reference to active site not joining to substrate / active site changing shape / enzyme–substrate complex no longer forms **ALLOW** enzymes not working at optimum **AO2.1 Applies knowledge and understanding of scientific ideas to link denaturing of enzymes to growth** • enzymes required for photosynthesis/ respiration/metabolic reactions/uptake of minerals by active transport • if enzymes aren't working less photosynthesis/respiration/metabolic reactions/uptake of minerals by active transport • less energy from respiration for growth

			Level 1 (1–2 marks) Identifies crop **D** with an attempt at an explanation **AND** Demonstrates some knowledge of enzymes *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.*			**ALLOW** idea that enzymes are required for growth **MAX L2 if additional references to temperature denaturing the enzymes**

Question			Answer	Marks	AO element	Guidance
14	(a)		Idea of randomly choosing squares ✓	1	2.2	**ALLOW** not biased / even chance of choosing any square **IGNORE** fair test
	(b)	(i)	**First check the answer on answer line** **If answer = 10 800 award 2 marks** 12 x 900 ✓ = 10 800 ✓	2	2 x 2.2	 **ALLOW** there are 12 snails in $1m^2$ **IGNORE** just '12' **ALLOW** (mean number of snails = 3 so) 3 x 900÷0.25 **DO NOT ALLOW** 12 x 900 ÷ 0.25
		(ii)	**Any two from:** Idea of counting snails in more squares (within the grid) ✓ Repeat process in different areas (of the habitat) ✓ Repeat count at different times of the day / different weather conditions ✓ Repeat using capture recapture method ✓	2	2 x 3.3b	**Mark whole answer and credit correct answers anywhere** **IGNORE** just "repeat" (the investigation) **ALLOW** count all the squares in grid / take more samples **IGNORE** increases grid size / count squares in the whole habitat / use larger quadrat/square / calculate the mean / use a bigger sample size **IGNORE** just 'look at larger area' **ALLOW** repeat many times in whole area of habitat / repeat process in different locations (of the habitat) **IGNORE** repeat in different habitat **ALLOW** repeat on a different day **IGNORE** use a line transect

	(c)		**Any four from:** Method of marking out a (straight) line ✓ Select sites along the tape set distances apart ✓ Use a quadrat (next to tape) ✓ Count the number of (different) <u>species</u> (within quadrat) ✓ Use Key to identify plants ✓ Use <u>kite</u> diagram to present observations ✓	**4**	**4 x 1.2**	e.g., use tape measure/string/poles **IGNORE** just 'use a line' / 'use a belt transect' **ALLOW** specified set distances along the tape e.g., mark 1m intervals along the transect / every few meters / place squares in a line (to form a belt transect) **ALLOW** place square alternating either side of line **IGNORE** move the transect line **ALLOW** place a quadrat equal distances (along line) = 2 marks **ALLOW** record the number of <u>species</u> (within quadrat) / measure the number of <u>species</u> (within quadrat) / record the different (plant) <u>species</u> **IGNORE** count the number of different plants/organisms / record an estimate of the different plant species

Question			Answer	Marks	AO element	Guidance
15	(a)		Mutualism ✓	1	2.1	**ALLOW** symbiosis / mutualistic **ALLOW** mutually beneficial **IGNORE** mutual
	(b)		**Any three from:** Mutation occurred / population will show variation ✓ Those with a long(er) beak get more food/nectar / **ORA** ✓ (More food means) survival more likely ✓ Pass on allele (for longer beak to next generation/offspring) ✓ Over (many) generations beak length increases (within the population) / over (many) generations allele frequency increases ✓	3	3 x 1.1	 **ALLOW** show a variety of beak lengths **IGNORE** some birds will have longer beaks than others **ALLOW** those with long(er) beaks could reach (further) into flower / those with long(er) beaks had better access to food / long(er) beaks help them feed better / long(er) beaks help them reach more pollen **IGNORE** long(er) beaks were an advantage / just 'long(er) beaks help them feed' **ALLOW** birds with long(er) beaks survive / those with short(er) beaks died / reference to survival of the fittest **ALLOW** pass on genes (for longer beak to next generation/offspring) **IGNORE** pass on genetics/DNA **ALLOW** allele for short beak is not passed on **ALLOW** (many) generations later no more short beaks/all had long beaks

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	Independent variable: (Different) antibiotics Dependent variable: Size/area/diameter of (clear) zone ✓	1	2.2	Both needed for mark **IGNORE** growth of bacteria
		(ii)	C ✓	1	3.1a	
		(iii)	As a control / comparison✓ To show that it is (only) the antibiotic (not the paper) having the effect ✓	2	2 x 2.2	**ALLOW** to show the difference between antibiotics and no antibiotics / to see how much bacteria growth is inhibited without the antibiotic **IGNORE** control variable **ALLOW** to show the paper has no effect (on bacteria) / to ensure that no antibiotic results in no clear zone **IGNORE** to see the effects of antibiotics / to prove the antibiotics work
		(iv)	E ✓ Largest/larger zone (of inhibition) ✓	2	2 x 3.1a	Mark independently **ALLOW** largest/larger diameter/area/ring/circle/inhibition(zone)
	(b)		Prevent <u>contamination</u> of surroundings / may have (grown) harmful bacteria / (idea of) risk to human health ✓	1	1.2	**ALLOW** to prevent the bacteria spreading diseases/illness/infections **IGNORE** just 'stop spread of bacteria' / bacteria are dangerous / contamination of agar plates/experiment

	(c)		(Place antibiotic disc **A**) on agar/plates containing different bacteria ✓	**2**	**2 x 3.3a**	**ALLOW** (place antibiotic disc **A**) on agar/plates containing (one) other bacteria / repeat (original) investigation with agar/plate(s) containing different bacteria / test all the antibiotics with agar/plate(s) containing different bacteria **IGNORE** just 'test different bacteria with antibiotic **A**' **ALLOW** different discs of bacteria on agar/plate containing antibiotic **A** I**GNORE** puts antibiotic discs on one (agar) plate containing different bacteria
			And any one from: Leave in same conditions ✓ Leave for same length of time/3 days ✓ Compare the size/diameter/area/radius of the (clear) zones ✓			**ALLOW** named condition e.g. temperature, volume or amount of agar **ALLOW** compare how much clear zone is around antibiotic (**A**) **IGNORE** 'see different rates of growth'

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