

Higher

GCSE

Combined Science B Twenty First Century Science

J260/01: Biology (Foundation 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.

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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. 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.

The level of response question on this paper is **4a**

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 B:

	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.

Question			Answer	Marks	AO element	Guidance
1	(a)	(i)	heart ✓	1	1.1	
		(ii)	immune system ✓	1	1.1	
	(b)		<p>Chemical</p> <p>Microbial</p> <p>Physical</p> <p>Bacteria in the gut compete against pathogens</p> <p>Skin stops pathogens entering the body</p> <p>Stomach acid destroys pathogens ✓✓</p>	2	1.1	One or two correct line(s) = 1 mark Three correct lines = 2 marks
	(c)		<p>They make her blood clot ✓</p> <p>They stick to the edges of the cut ✓</p>	2	2.1	

Question		Answer	Marks	AO element	Guidance
2	(a)	some ✓ some ✓	2	1.1	
	(b)	(i) 7 ✓	1	2.2	
		(ii) y-axis scale correct ✓ group 3 bar plotted at 4 ✓ group 4 bar plotted at 5 ✓	3	2.2	IGNORE width of bars
		(iii) Mean of group 4 > Mean of group 3 ✓	1	2.2	
		(iv) Any two from: bigger sample / collect data from more 16-year-olds ✓ include boys and girls / different sexes/genders ✓ include different ethnicities ✓ include people from different areas/regions ✓	2	3.3a	ALLOW collect data from more people ALLOW ask boys

Question			Answer	Marks	AO element	Guidance
3			(A) E D B C ✓✓✓	3	2.1	E before D = 1 mark D before B = 1 mark B before C = 1 mark

Question		Answer	Marks	AO element	Guidance
4	(a)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks)</p> <p>Explains in detail advantages and disadvantages of stopping people from cutting down trees in the forest.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks)</p> <p>Explains in some detail advantage(s) and disadvantage(s) of stopping people from cutting down trees in the forest.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks)</p> <p>Gives an outline explanation of advantage(s) OR disadvantage(s) of stopping people from cutting down trees in the forest.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks</p> <p><i>No response or no response worthy of credit.</i></p>	6	2.1 x 6	<p>AO2.1 Applies understanding to explain advantages and disadvantages of stopping people from cutting down the trees in this forest</p> <p>Advantages</p> <ul style="list-style-type: none"> • Animals depend on trees for habitat • Animals depend on trees for food / More food available • Idea of not disrupting food chains • More animals can survive / reduces chance of extinction/killing animals • Maintains biodiversity • Trees absorb carbon (dioxide) / role of trees in carbon cycle • So less global warming / less climate change / less extreme weather • Prevent soil erosion • Is a source of medicines <p>Disadvantages</p> <ul style="list-style-type: none"> • Less firewood for fuel/heating their homes • Less building material / less space to build houses • Less farmland to grow crops/keep animals • Increases chance of hay fever from tree pollen • More fossil fuels need to be used • Trees are a renewable resource so can be grown again • Less jobs/work available

Question		Answer	Marks	AO element	Guidance																				
	(b)	(differences in their) genome / genetic factors / genes / alleles / genetic variants / chromosomes / mutation(s) ✓	1	1.1	ALLOW sexual reproduction/ different sperm or egg ALLOW genetics/genetic variation/genetic material/genotype/DNA base sequence IGNORE DNA unqualified DO NOT ALLOW evolution / natural selection / adaptation																				
	(c)	Fossils show that features of a species can change over time ✓ Some fossils have features of newer species and features of earlier species ✓	2	1.1																					
	(d)	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;">True</th> <th style="width: 10%; text-align: center;">False</th> <th style="width: 20%;"></th> </tr> </thead> <tbody> <tr> <td>Antibiotics kill resistant bacteria.</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Bacteria that are resistant...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> <tr> <td>Genetic mutations caused...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>More and more bacteria...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">✓✓</td> </tr> </tbody> </table>		True	False		Antibiotics kill resistant bacteria.	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Bacteria that are resistant...	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Genetic mutations caused...	<input type="checkbox"/>	<input checked="" type="checkbox"/>		More and more bacteria...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	✓✓	2	1.1	Any one statement correct = 0 marks Any two or three statements correct = 1 mark All four statements correct = 2 marks
	True	False																							
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More and more bacteria...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	✓✓																						
	(e)	Any two from: use genetic testing / genome sequencing / gene probes ✓ look for similarities/differences in genes/genetic variants/ DNA/genome sequence ✓ idea that more similarity means organisms are more likely to be the same species / share a common ancestor / ORA ✓	2	1.1	IGNORE DNA testing ALLOW compare genes/DNA																				

Question		Answer	Marks	AO element	Guidance															
5	(a)	grass ✓	1	2.1	IGNORE at the start of the food chain / the producer															
	(b)	<p>First check the answer on answer line If answer = 4.57 (%) award 3 marks</p> <p>37 ÷ 810 x 100 ✓ = 4.56790123 ✓ = 4.57 to 3 s.f. ✓</p>	3	2.2 x 2 1.2	<p>ALLOW 4.60/4.6</p> <p>ALLOW any number that is correctly converted to 3 s.f. eg 21.9</p>															
	(c)	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 15%; text-align: center;">True</th> <th style="width: 15%; text-align: center;">False</th> </tr> </thead> <tbody> <tr> <td>The sugars are joined together...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Lipids are made from the...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>The fatty acids are joined together...</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Making proteins also requires...</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		True	False	The sugars are joined together...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lipids are made from the...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The fatty acids are joined together...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Making proteins also requires...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	1.1	<p>Any one statement correct = 0 marks Any two or three statements correct = 1 mark All four statements correct = 2 marks</p>
	True	False																		
The sugars are joined together...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		
Lipids are made from the...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																		
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Making proteins also requires...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																		

Question		Answer	Marks	AO element	Guidance															
6	(a)	<table border="1"> <tr> <td></td> <td>Carbon dioxide</td> <td>Oxygen</td> <td>Water</td> <td></td> </tr> <tr> <td>Used for photosynthesis</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Made by photosynthesis</td> <td></td> <td>✓</td> <td></td> <td>✓</td> </tr> </table>		Carbon dioxide	Oxygen	Water		Used for photosynthesis	✓		✓	✓	Made by photosynthesis		✓		✓	2	1.1	One mark for each correct row
		Carbon dioxide	Oxygen	Water																
Used for photosynthesis	✓		✓	✓																
Made by photosynthesis		✓		✓																
	(b)	(50 – 15 =) 35 (mm) ✓	1	2.2																
	(c)	(i) 30 (°C) ✓	1	3.2b																
		(ii) First check the answer on answer line If answer = 1 award 2 marks 20 ÷ 20 ✓ = 1 ✓	2	2.2																
	(d)	Any three from: <i>(At higher temperature:)</i> evaporation is faster / more water is lost from the leaves/plant/shoot ✓ transpiration is faster ✓ photosynthesis is faster ✓ more water taken up to replace the water lost from the leaves/in photosynthesis ✓	3	1.1	IGNORE kinetic energy unqualified															
7	(a)	(i) exothermic ✓	1	1.1																

Question		Answer			Marks	AO element	Guidance	
	(ii)	carbon dioxide / CO ₂ ✓			1	2.1	IGNORE gas given off	
(b)			Both types of respiration	Only aerobic respiration	Only anaerobic respiration	2	1.1	Any one or two rows correct = 1 mark All three rows correct = 2 marks
		Happens without...			✓			
		Produces the most...		✓				
		Requires glucose	✓					
		✓✓						
(c)		<p>Any one from: number/concentration of yeast/cells might be different in different parts of the flask / they may not have mixed the solution first ✓</p> <p>some of the yeast/cells may be dead ✓</p> <p>idea of uncertainty about volume of mixture in one drop / the flask ✓</p>			1	2.2	IGNORE ideas such as 2 million yeast cells cannot be counted/ they are too small to count/ there have been counting errors	
(d)	(i)	<p>First check the answer on answer line If answer is in range of 0.5 - 0.8 (micrometers) award 2 marks</p> <p>comparison of length between height and length bar to be approximately in ratio of 1:3 / 2:5 ✓ height must be between 0.5 – 0.8 (micrometers) ✓</p>			2	3.1a		
	(ii)	small ✓ close together ✓			2	1.2		
8	(a)	(i)	First check the answer on answer line			2	2.2	

Question		Answer	Marks	AO element	Guidance
		<p>If answer = 8 (cm³) award 2 marks</p> <p>2 x 2 x 2 ✓ = 8 (cm³) ✓</p>			
	(ii)	<p>First check the answer on answer line If answer = 2:1 award 2 marks</p> <p>Evidence of division of 54 : 27 to simplify ✓ = 2:1 (by dividing by 27) ✓</p>	2	2.2	IGNORE unsimplified ratios
	(iii)	As cube size increases, surface area:volume ratio decreases / ORA / less surface area per (unit of) volume ✓	1	3.1a	
	(iv)	<p>(Prediction) D ✓</p> <p>(Explanation) stain has a longer distance to reach the centre OR less surface area for stain to get into the cube per (unit of) volume ✓</p>	2	3.2a	<p>If incorrect cube letter given 0 marks</p> <p>ALLOW has more jelly to pass through/more jelly to reach the centre</p>
(b)	(i)	<p>greater surface area ✓</p> <p>(so) more water/substances can be absorbed OR (so) water/substances can be absorbed more quickly ✓</p>	2	2.1	
	(ii)	<p>short distance for water/substances to move/diffuse (into the blood/vessels) ✓</p> <p>blood (vessels) carry/transport water/substances away/to every part/cell/around the body ✓</p>	2	2.1	<p>IGNORE blood transports oxygen to the cells/body</p> <p>ALLOW they maintain a concentration gradient</p>
9	(a)	most features are controlled by multiple genes ✓	1	1.1	

Question	Answer	Marks	AO element	Guidance
(b)	<p>A dominant or recessive... ✓</p> <p>Allele</p> <p>A section of a chromosome ✓</p> <p>Chromosome</p> <p>A sex cell used for...</p> <p>Gene</p> <p>A very long molecule... ✓</p> <p>Genome</p> <p>All the genetic material... ✓</p> <p>The part of a cell where..</p>	4	1.1	
(c)	<p>phenotype is the feature/characteristic/trait (that results from the genotype) ✓</p> <p>genotype is the alleles you have/inherit OR genotype is the genetic variants you have/inherit ✓</p>	2	1.1	<p>ALLOW it is our physical features / it is what you look like IGNORE named examples of inherited traits unless given as part of the explanation</p> <p>DO NOT ALLOW it is the genes you have/inherit</p>
(d)	<p>they are/store instructions/code ✓</p> <p>for joining together amino acids / to make proteins ✓</p>	2	1.1	
(e)	<p>idea of the feature and the environmental factor that affects it ✓</p>	1	2.1	<p>ALLOW any sensible example eg scar/damage from injury poor diet affects weight/height sun exposure leads to suntan/burning smoking causes staining/wrinkles dyeing hair colour</p>

Question			Answer	Marks	AO element	Guidance
10	(a)	(i)		1	1.2	All three lines correct = 1 mark
		(ii)	(D) C A B ✓	1	1.2	All three in correct order = 1 mark
		(iii)	stain ✓	1	2.2	ALLOW dye / named stain (e.g. haematoxylin, eosin, iodine, methylene blue) IGNORE universal indicator
	(b)	(i)	0.5 ✓	1	2.2	
		(ii)	1:1 ✓	1	2.2	ALLOW 2:2 / 50:50 or any other equal ratio
	(c)		Any two from: (SRY) gene(s) on the Y chromosome ✓ cause(s) development of testes ✓ cause(s) male hormones (to be made) ✓	2	1.1	IGNORE DNA on the Y chromosome ALLOW causes males to have testosterone / androgens

Question	Answer	Marks	AO element	Guidance
(d)	<p>MAX TWO FROM (benefits): (if positive) can start checks of heart/kidneys/reproductive system (sooner) ✓</p> <p>can start treatment for heart/kidneys/reproductive problems (sooner) ✓</p> <p>can plan healthcare/support/prepare for baby ✓</p> <p>can plan support for mother/family ✓</p> <p>the mother could choose to terminate / abort the baby / keep the baby ✓</p> <p>MAX TWO FROM (risks): could cause a miscarriage / harm the baby/mother ✓</p> <p>could be a false negative/positive ✓</p> <p>(no cure and) could cause stress to the mother/family / be unlikely for treatment options to be available for baby ✓</p>	3	3.1b	<p>IGNORE to know if they have Turner syndrome IGNORE ethical objections or concerns for benefits or risks</p> <p>ALLOW for 2 marks to provide support for the mother and the baby IGNORE to prepare unqualified</p> <p>ALLOW could kill the baby IGNORE side effects unless linked to harm</p> <p>ALLOW the test could be wrong / the test is not 100% reliable</p>

Question		Answer	Marks	AO element	Guidance
11	(a)	glands ✓ slower AND longer ✓	2	1.1	
	(b) (i)	First check the answer on answer line If answer = 80 (mg / 10 cm³) award 2 marks 190 – 110 ✓ = 80 (mg / 10 cm ³) ✓	2	2.2	
	(ii)	Between 5 minutes and 10 minutes ✓	1	3.1a	
	(iii)	(after it goes above 105 it is) reduced back towards 105 ✓ (after it goes below 105) it is increased back towards 105 ✓	2	3.2b	If no marks awarded ALLOW for 1 mark it goes back to 105 / it is 105 before the chocolate / it stays constant at 105 after 40 mins
	(c)	<i>Benefit:</i> prevents ovulation / release of egg(s) / fertilisation / conception / pregnancy ✓ <i>Risk:</i> not 100% effective / example of reason why pill may not work OR reference to side-effects / adverse reactions OR does not prevent STIs / named STI ✓	2	1.1	ALLOW lowers risk of pregnancy ALLOW regulates periods / controls/reduces heavy flow/cramps ALLOW ideas such as other medicines could interfere with it / you could forget to take it / if you are sick it doesn't work ALLOW increases risk of depression/weight gain/ increases risk of some cancers / could disrupt the cycle after stopping taking the pill

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