

Foundation

GCSE

Combined Science B Twenty First Century Science

J260/05: Biology (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.

© OCR 2023

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:
- where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
 - 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 **5c**.

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.

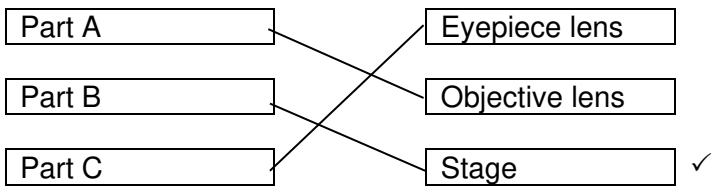
You should ensure that you have copies of these materials.

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

Question			Answer	Marks	AO element	Guidance
2	(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

Question			Answer	Marks	AO element	Guidance																												
3	(a)		an ecosystem a community a population an individual ✓✓✓	3	1.1	Two correct = 1 mark Three correct = 2 marks All four correct = 3 marks																												
	(b)		<table><tr><td></td><td>Biotic</td><td>Abiotic</td><td>Not part</td></tr><tr><td>Air</td><td></td><td>Tick</td><td></td></tr><tr><td>Human</td><td>Tick</td><td></td><td></td></tr><tr><td>Ocean water</td><td></td><td>Tick</td><td></td></tr><tr><td>Plastic pollution</td><td></td><td>Tick</td><td></td></tr><tr><td>Sea bird</td><td>Tick</td><td></td><td></td></tr><tr><td>Seaweed</td><td>Tick</td><td></td><td></td></tr></table> ✓ ✓		Biotic	Abiotic	Not part	Air		Tick		Human	Tick			Ocean water		Tick		Plastic pollution		Tick		Sea bird	Tick			Seaweed	Tick			2	1.1	One mark for each correct column Ignore any ticks in the 'Not part'
	Biotic	Abiotic	Not part																															
Air		Tick																																
Human	Tick																																	
Ocean water		Tick																																
Plastic pollution		Tick																																
Sea bird	Tick																																	
Seaweed	Tick																																	
	(c)		Water (vapour) ✓	1	1.1																													
	(d)		the carbon dioxide is used for photosynthesis in producers/seaweed/algae/plants/(phyto)plankton ✓ this makes biomass/food OR this fixes the carbon / moves the carbon back into the food chain ✓ the animals/consumers can only get the carbon they need by eating the producers/seaweed/algae/plants/(phyto)plankton ✓	3	2.1	ALLOW correct reference to photosynthesis ALLOW idea of animals eating plants																												

Question			Answer	Marks	AO element	Guidance
4	(a)		fungus / fungi ✓	1	1.1	ALLOW fungal
	(b)		First check the answer on the answer line If answer = 21 award 3 marks $(24 + 17 + 9 + 35) \div 4 = 85$ ✓ $= 21.25$ ✓ $= 21$ (%) (to 2 sig. fig.) ✓	3	1.2	ALLOW incorrect calculation to 2 sig figs
	(c)	(i)	y-axis numbered AND labelled appropriately ✓ February bar plotted at 6 AND March bar plotted at 8 AND April bar plotted at 15 ✓	2	2.2	IGNORE width of bars, provided they do not extend outside their categories ALLOW Bars correct with number or labels
		(ii)	each month it is increasing (by a greater amount / more rapidly) ✓	1	3.1a	IGNORE reference to temperature
		(iii)	spread the pathogen/fungus (from infected to uninfected trees) on their hands/clothes/footwear/pets/tyres ✓	1	2.1	ALLOW by touch
		(iv)	Any one from: lack of food (for primary/secondary consumers in the food chain) ✓ loss of habitat ✓	1	2.1	ALLOW idea that if no trees habitats are reduced.
		(v)	Any one from: destroy/remove infected trees ✓ use chemical control / use an antimicrobial/antifungal ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance									
5	(a)	(i)	Any two from: so that it can contract ✓ with enough force/power/pressure✓ pump (oxygenated) blood further /around the body ✓	2	1.1										
		(ii)	so that oxygenated blood doesn't go back (to the lungs / atrium when chamber A contracts) ✓	1	1.1	ALLOW to prevent backflow (of blood) ALLOW The idea of blood travelling in one direction									
	(b)		<table><tr><td>Artery ✓</td><td></td><td>Hold/withstand high pressure blood ✓</td></tr><tr><td></td><td>Wall only one cell across ✓</td><td></td></tr><tr><td>Vein ✓</td><td>Valves ✓</td><td></td></tr></table>	Artery ✓		Hold/withstand high pressure blood ✓		Wall only one cell across ✓		Vein ✓	Valves ✓		5	1.1	ALLOW for capillary the idea of one cell thick
Artery ✓		Hold/withstand high pressure blood ✓													
	Wall only one cell across ✓														
Vein ✓	Valves ✓														

Question	Answer	Marks	AO element	Guidance
(c) *	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) Describes fully in detail how to measure resting pulse rate before exercise and recovery time after exercise. AND Describes fully in detail how to calculate a best estimate (mean) of the recovery time. <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) Describes in some detail how to measure resting pulse rate using stopwatch before exercising on the step OR Describes in some detail how to investigate the effect of exercise on pulse rate. AND Describes in some detail how to measure recovery time using stopwatch after exercising. <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) Describes in an outline how to measure pulse rate using stopwatch. OR Describes in an outline how to measure recovery time using stopwatch after exercising. OR Describes an outline of how to carry out investigation, exercise on pulse rate <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>	6	3.3a x 4 2.2 x 2	AO3.3a Developing a procedure to investigate pulse rate using only the specified equipment <i>To measure pulse rate using the stopwatch</i> - press fingers against pulse point / artery (in wrist temple) - measure pulse rate - time for defined period of time on stopwatch - count number of pulses/beats <i>To investigate effect of exercise on resting pulse rate</i> - sit calmly for a while before measuring resting pulse rate - measure pulse rate before exercising - to exercise, step onto and off the step repeatedly - for a defined period of time - measure pulse rate again immediately after exercise has finished <i>To measure recovery time</i> - measure pulse rate repeatedly / every few minutes after exercise - note how long it takes to return to resting pulse rate AO2.2 Applying understanding of how to calculate a best estimate (of a quantity) - repeat the test (several times) - in each repeat use same person / same height of step / same duration of exercise - calculate mean of recorded recovery times

Question			Answer	Marks	AO element	Guidance									
6	(a)		circulatory AND excretory ✓	1	1.1	ALLOW circulation ALLOW excretion									
	(b)	(i)	<table border="1"><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td>cloudy/white (emulsion) ✓</td></tr><tr><td>protein(s) ✓</td><td></td><td>lilac/purple ✓</td></tr></table>						cloudy/white (emulsion) ✓	protein(s) ✓		lilac/purple ✓	3	1.2	 ALLOW milky
		cloudy/white (emulsion) ✓													
protein(s) ✓		lilac/purple ✓													
		(ii)	for (aerobic) respiration OR to provide ATP / energy ✓	1	1.1	 ALLOW transfer energy/release energy									
	(c)		<i>Prediction:</i> the candle in beaker B will burn for a shorter time than the candle in beaker A / ORA ✓ Any three from (explanation): exhaled air contains less/low oxygen because it has been absorbed into the blood/circulatory system / by the lungs/gaseous exchange system ✓ exhaled air contains less/low oxygen because it has been used for (cellular) respiration ✓ exhaled air contains more/high carbon dioxide because it has diffused/moved out of the blood / out of the circulatory system into the air (in the lungs) ✓ exhaled air contains more/high carbon dioxide because it is produced by (cellular) respiration / released by the gas exchange system ✓	4	2.2 2.1 x 3										

Question			Answer	Marks	AO element	Guidance
	(d)		Any three from: eating lots of fatty food will increase Ryan's risk of developing CVD ✓ (high levels of) (LDL) cholesterol (in the blood) is a risk factor for CVD / increases the risk of CVD ORA ✓ having the faulty gene will reduce Ryan's risk of CVD because the channels are not made correctly / cannot absorb cholesterol correctly ✓ Ryan's risk of CVD is not zero because some cholesterol will still be taken up (into the blood) / because only some of the uptake of cholesterol happens through the channels ✓	3	2.1	ALLOW Reverse argument that risk could be increased

Question			Answer	Marks	AO element	Guidance
7	(a)		variation ✓	1	1.1	
	(b)		a mutation / a (new) genetic variant / a change in the DNA/genome/genes ✓	1	2.1	
	(c)		Any three from: reference to <u>selective breeding</u> / <u>artificial selection</u> ✓ (only) grow seeds/seedlings/offspring from plants producing carrots that were darkest orange ✓ breed/cross plants producing carrots that were darkest orange ✓ to try to produce even darker orange carrots/better survival in the next generation ✓	3	2.1	DO NOT ALLOW natural selection / evolution ALLOW If no other marks awarded, One mark for correct description of selective breeding
	(d)		ref. to DNA analysis / (genome) sequencing / genetic testing ✓ if their genomes/genes/DNA/genotypes are sufficiently different / have (lots of) different/new genetic variants ✓	2	2.1	IGNORE the idea that they're separate species if they cannot breed to produce fertile offspring. ALLOW Idea of looking for differences in genes

Question			Answer	Marks	AO element	Guidance
8	(a)		chloroplasts contain chlorophyll ✓ (chloroplast/chlorophyll) <u>absorbs</u> light (for the first stage of photosynthesis) / to split water into oxygen and hydrogen ✓	2	1.1	
	(b)		transpiration ✓	1	1.1	
	(c)	(i)	100 AND 130 ✓	1	3.1a	ALLOW any two distances between 100 and 130 inclusive
		(ii)	First check the answer on the answer line If answer = 4.8×10^{-5} (litres / hour) award 3 marks 48 ✓ $\times 0.000001 = 0.000048$ ✓ $= 4.8 \times 10^{-5}$ (litres / hour) ✓	3	2.2 1.2 x 2	
		(iii)	First check the answer on the answer line If answer = 0.21 (mm³ / hour / cm) award 2 marks 48-27 or 21 ✓ $(48 - 27) \div 100 = 0.21$ (mm ³ / hour / cm) ✓	2	2.2	IGNORE sign
	(d)	(i)	First check the answer on the answer line If answer = 4 (%) award 2 marks $0.4 \div 10 = 0.04$ ✓ $\times 100 = 4$ (%) ✓	2	1.2	
		(ii)	Any two from: (most of the) water taken up is lost by transpiration/evaporation ✓ lost through open stomata ✓ only a tiny amount remains/used in plant cells / used in photosynthesis/to build biomass ✓	2	3.2b	ALLOW idea that some water is lost in ways other than transpiration

Question			Answer	Marks	AO element	Guidance
9	(a)		human genes mitosis ✓✓	2	1.1	One or two correct = 1 mark All three correct = 2 marks
	(b)		Any two from: <u>ionising</u> radiation / named example e.g. ultraviolet/UV / sunlight / X-rays / alpha/beta/gamma rays (from radioactive decay) ✓ inherited/genetic factors / particular alleles/genetic variants e.g. human papillomavirus/HPV, hepatitis B/C, herpes viruses (EBV, KSHV), HTLV, /obesity ✓ named example of pathogen ✓	2	1.1	DO NOT ALLOW non-ionising radiation e.g. microwaves, infrared, radiowaves, mobile phone signals ALLOW lack of exercise ALLOW “family history”
	(c)		the person will not be able to detect / destroy pathogens / foreign/non-self-things ✓ the person can/cannot make white blood cells ingest/digest pathogens / make antibodies / become memory cells ✓ (so) the person will be less healthy because they will catch more / be at higher risk of communicable/infectious diseases ✓	3	2.1	IGNORE Idea of ‘fighting’ diseases/pathogens ALLOW idea of weaker immune system increasing risk of disease
	(d)		Any two from: red blood cells do not have a nucleus/chromosomes/DNA/genome ✓ (because they are adapted to) carry as much haemoglobin/oxygen as possible ✓ (so) cannot go through mitosis ✓	2	2.1	DO NOT ALLOW “cannot divide” as this is given in the question stem
	(e)		<i>Benefit:</i> the transplanted stem cells can become specialised/differentiate to make new (red/white) blood cells ✓	2	2.1	DO NOT ALLOW “they will have white blood cells so can fight disease” without ref. to the stem cells differentiating / becoming specialised DO NOT ALLOW “it may not work” without further explanation

Question			Answer	Marks	AO element	Guidance
			<i>Risk:</i> the transplanted cells might be rejected / might be destroyed by the immune system / ref. to risk of infection during transplant ✓			

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit



ocr.org.uk/qualifications/resource-finder



ocr.org.uk



Twitter/ocrextams



/ocrextams



/company/ocr



/ocrextams



CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2023 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

Registered company number 3484466. OCR is an exempt charity.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please [contact us](#).

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our [Expression of Interest form](#).

Please [get in touch](#) if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.