

Higher

GCSE

Combined Science Biology A Gateway Science

J250/08: Paper 8 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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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 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 posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca
- 3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 40% 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 or the RM Assessor messaging system, or by email.

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 a tick 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 e-mail.
- 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.

For answers marked by levels of response: Not applicable in F501

- a. To determine the level start at the highest level and work down until you reach the level that matches the answer
- b. To determine the mark within the level, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

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 questions on this paper is **15(b)**.

11. Annotations available in RM Assessor

Annotation	Meaning
✓	Correct response
×	Incorrect response
^	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
1	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 Biology/Combined Science A:

Assessment Objective
Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
Demonstrate knowledge and understanding of scientific ideas.
Demonstrate knowledge and understanding of scientific techniques and procedures.
Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
Apply knowledge and understanding of scientific ideas.
Apply knowledge and understanding of scientific enquiry, techniques and procedures.
Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
Analyse information and ideas to interpret and evaluate.
Analyse information and ideas to interpret.
Analyse information and ideas to evaluate.
Analyse information and ideas to make judgements and draw conclusions.
Analyse information and ideas to make judgements.
Analyse information and ideas to draw conclusions.
Analyse information and ideas to develop and improve experimental procedures.
Analyse information and ideas to develop experimental procedures.
Analyse information and ideas to improve experimental procedures.

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

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

Qu	esti	on	Answer	Marks	AO element	Guidance
11	(a)	(i)	Quadrat ✓	2	2 x 1.1	
		(ii)	Random ✓ FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 660 award 3 marks 2.5 ✓ 11 x 15 2.5	3	3 x 2.2	ALLOW 0.25 and 15 anywhere in answer for one mark ALLOW 11 anywhere in answer for one mark ALLOW 15 x 11 for 2 marks 0.25
			660 ✓			ALLOW 6600 for two marks
	(b)	(i)	Suitable scale on correctly chosen axes ✓ Both axes labelled including unit ✓	4	4 x 2.2	Minimum 50% of grid used Scale must be in ascending order / 0,0 not required x-axis distance from shed and y-axis number of daisies x-axis: distance (from shed) m and y-axis: number of daisies
			All points accurately plotted ✓ Suitable best straight line ✓			Distance from shed (m) Number of daisies 1.0 0 1.5 2 2.0 4 2.5 6 3.0 8 3.5 10 4.0 12 4.5 14 5.0 16 ALLOW +/- half a square for plotting IGNORE any extrapolation of line add ticks and crosses to right hand side of grid

Q	Question		Answer	Marks	AO element	Guidance
		(ii)	4 ✓	1	2.2	ALLOW ecf from (b)(i)
		(iii)	Any two from:	2	2 x 3.2b	
			Daisy growth is reduced ✓			ALLOW less/no daisies near the shed / ORA
			(shed) blocks/reduces light on lawn/daisies ✓			ALLOW the daisies are in the shade ALLOW more light further from the shed ALLOW daisies need light to grow IGNORE just Sun
			Reduced photosynthesis / not able to photosynthesise ✓			ALLOW light is needed for photosynthesis

Que	estic	n	Answer	Marks	AO element	Guidance
12 (a)		Biotic Abiotic Temperature Carbon dioxide	3	3 x 1.1	All four correct = 3 marks Two or three correct = 2 marks One correct = 1 mark
(1	b)	(i)	Section of nodule taken using scalpel/razor/sharp blade	3	3 x 1.2	ALLOW sharp knife IGNORE just 'knife' IGNORE cut with a peeler IGNORE take a thin layer of nodule / one cell thick layer / peel a thin layer of nodule
			Then any two from: Sample is placed onto a (microscope) slide ✓ Use of cover slip (on top) ✓ Use of stains (to show up structures) ✓			IGNORE place it onto a cover slip ALLOW add a dye or named stains e.g. iodine solution / methylene blue ALLOW description of a stain e.g. a solution that
			Idea of using low power first ✓ Any safety measure/precautions ✓			shows up the structures IGNORE just a solution/water/(universal) indicator/blue ink ALLOW use coarse focus then fine focus ALLOW e.g. cutting away from body when using scalpel / always move objective lens away from slide when looking down the eye piece / tap gently to remove air bubbles IGNORE push cover slip down to get rid of air bubbles
		(ii)	Electron (microscope) ✓	1	2.2	ALLOW SEM / TEM

Question	Answer	Marks	AO element	Guidance
				IGNORE electric/electronic
(c)	Any three from:	3	3 x 1.1	
	Idea bacteria provide nitrates so Plants can make <u>more</u> amino acids ✓			ALLOW plants cannot use nitrogen to make nitrates/amino acids so rely on bacteria for nitrates IGNORE bacteria convert nitrogen to nitrates IGNORE plants use nitrates to make amino acids IGNORE plants take in amino acids
	Idea that plants can make proteins (using the amino acids/nitrates) ✓			IGNORE plants use amino acids in photosynthesis/ growth
	Idea that bacteria receive carbohydrates/sugar/glucose made by the plant (from photosynthesis) ✓			IGNORE bacteria gets food/energy from plants
	Mutualism relationship between them ✓			ALLOW symbiotic relationship / mutually beneficial relationship / description e.g. both organisms benefit / mutual relationship
				DO NOT ALLOW bacteria are parasites

Q	uesti	ion	Answer	Marks	AO element	Guidance
13	(a)	(i)	pH of acid rainwater ✓	1	1.2	Amount of light sunflowers receive Height of sunflowers Number of sunflowers pH of acid rainwater Volume of rainwater added to sunflowers
		(ii)	Use a (digital) pH meter/probe ✓	2	2 x 3.3b	
			Water with equal volumes of (rain)water ✓			ALLOW acid for (rain)water ALLOW use the same/equal amount of (rain)water ALLOW use the same amount not similar amount ALLOW example of same volume e.g. use 100cm³ of (rain)water IGNORE measure the amount of water added / use a specific/exact amount / put a lid on to stop evaporation
		(iii)	(Acid rain) contains nitrogen oxide/nitric acid/nitrogen ✓	1	3.1b	IGNORE repeats / do it for longer ALLOW sulfuric acid does not contain nitrogen
		, ,				oxide/nitric acid/nitrogen IGNORE other acids are involved / other gases form acid rain IGNORE no oxygen/carbon dioxide/water
		(iv)	Add/test with nitric acid ✓	1	3.3a	IGNORE uses actual rainwater / add nitrogen / use nitrogen oxide
	(b)	(i)	pH 4.0 − 4.6 ✓	1	3.1a	pH 2.0 – 3.6 pH 3.0 – 3.6 pH 4.0 – 4.6 pH 5.0 – 5.6

Question	Answer	Marks	AO element	Guidance
(ii)	Any two from:	2	2 x 2.1	
	Lowers biomass ✓			ALLOW decreases (crop) yields / slows biomass production / hinders biomass production / has a negative impact on biomass ALLOW higher the pH/weaker the acid the greater the biomass
				IGNORE crops may not prosper
				DO NOT ALLOW the lower the pH the greater the biomass
	Reduces (plant) growth ✓			ALLOW shorter plants / hinders growth (of plants) ALLOW the more acidic the rain the less growth there is ALLOW (lower pH/stronger) acid kills plants or stops growth ALLOW higher the pH the greater the growth/biomass
				IGNORE affects growth / impacts growth / disturbs growth / disrupts growth / yellow leaves / wilting / weakens the plant
				DO NOT ALLOW the lower the pH the greater the growth
	Plants produce biomass during photosynthesis ✓			ALLOW acid rain reduces rate of photosynthesis
				IGNORE references to food chains and biodiversity

Q	uesti	on	Answer	Marks	AO element	Guidance
14	(a)	(i)	Communicable diseases decreased ✓ Non-communicable diseases increased ✓	2	2 x 3.1a	DO NOT ALLOW increased / staying the same DO NOT ALLOW decreased / staying the same IGNORE comparisons between the two types
		(ii)	(Reduced communicable diseases suggest) improved sanitation / improved healthcare / improved water treatment / reduced poverty / less overcrowding ✓	2	2 x 2.1	ALLOW better hygiene / improved medication ALLOW vaccination programmes introduced IGNORE cleaner country / improved living conditions
			(Increased non-communicable diseases suggest) more unhealthy eating / less exercise / increase in smoking / increase in alcohol (consumption) ✓			ALLOW ageing population reveals more non- communicable diseases / people are living longer so more likely to get a non-communicable disease ALLOW increase in high fat diet / increase in high sugar diet / increase in high salt diet / more junk food / increase in obesity IGNORE just poor diet
	(b)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 15400 award 2 marks	2	2 x 2.2	TOTAL Justipus diet
			2 8 x 55 000 000 100 000 ✓			ALLOW <u>28x55million</u> or 28 x 550 10 ⁵
			15400 / 1.54 x 10⁴√			ALLOW for one mark 154/1540/154000/1540000 etc

Question	Answer	Marks	AO element	Guidance
(c)	Any two from: (Antibody) specific/complementary to antigen (on pathogen) ✓	2	2 x 1.1	
	(Antibody) bind to antigen (on surface of pathogen) ✓			ALLOW antibodies stick/cling/lock to antigens IGNORE antibodies fight/destroy/engulf antigens IGNORE antibodies bind to pathogens
	Restricting pathogen movement around the body ✓			ALLOW idea that pathogens become clumped together
	(After antibodies bind to antigens) phagocytes then engulf the pathogen ✓			ALLOW (after antibodies bind to antigens) white blood cells then engulf the pathogen ALLOW ingest/digest for engulf
				IGNORE kill/eat IGNORE antibodies produce phagocytes / antibodies engulf the pathogen IGNORE reference to memory cells
(d)	Deactivated or weak form of pathogen / antigens ✓	2	2 x 1.1	ALLOW dead pathogen / inactive pathogen / ALLOW bacteria or virus for pathogen
				ALLOW pathogen that has been made harmless but IGNORE just 'harmless pathogens'
				IGNORE small dose of the pathogen IGNORE denatured pathogen / weak version of disease / antibodies /
	Antibodies made quicker if body is infected with same pathogen / Memory cells will react to further infections ✓			ALLOW mention of memory cells in correct context e.g. 'memory cells are produced / memory cells remain in the body IGNORE pathogen is stored in memory cell / antibodies contain memory cells

Question		Answer		Marks	AO element	Guidance	
male Homozyg	Heterozygous male Homozygous recessive female			1	1.2	BOTH ticks required for mark	
	(ii)				3	3 x 2.2	NOTE male and female must be labelled ALLOW other letters used as long as clear ALLOW all three marks from a Punnett square female/F/mum b b male/M B Bb Bb /dad b b b ALLOW ECF on offspring for incorrect parents ALLOW ECF from incorrect offspring percentage must match their offspring NOTE BRCA is dominant, i.e. Bb will be at risk NOTE if more than one diagram (with no crossing out) or no diagram then max one
		(a) (i)	Heterozygous male Homozygous recessive female (ii) Parents are male Bb Offspring are Bb, Bb	Risk Of Develor Cand Increased risk Heterozygous male Homozygous recessive female (ii) Parents are male Bb and female bb ✓ Offspring are Bb, Bb, bb, bb✓	Risk Of Developing Breast Cancer Increased risk Less risk Heterozygous male Homozygous recessive female (ii) Parents are male Bb and female bb ✓ Offspring are Bb, Bb, bb, bb✓	(ii) Risk Of Developing Breast Cancer Increased risk Less risk Heterozygous male Homozygous recessive female (ii) Parents are male Bb and female bb ✓ Offspring are Bb, Bb, bb, bb✓	Answer (a) (i) Risk Of Developing Breast Cancer Increased risk Less risk Heterozygous Marks Homozygous Fecessive female (ii) Parents are male Bb and female bb Offspring are Bb, Bb, bb, bb Answer Risk Of Developing Breast Less risk 1 1.2 3 3 x 2.2

Question	Answer	Marks	AO element	Guidance
(b)*	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) Makes detailed judgement both ethical and practical AND Applies detailed understanding of what information risk factor tool provides about next five years and lifetime risks There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.	6	3 x 2.2 3 x 3.2a	 AO2.2 Apply knowledge and understanding of scientific enquiry, techniques and procedures to identify useful information provided by risk factor tool lifetime risk of developing breast cancer is greater that general population lifetime risk is above the 20% threshold risk in next five years is very low AO3.2a Analyse information and ideas to make judgements on ethical and practical issues
	Level 2 (3–4 marks) Attempts to make a judgment either ethical or practical AND Applies understanding of what information risk factor tool provides about next five years or lifetime risks OR Attempts to make a judgment both ethical AND practical 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 to make a judgment either ethical or practical OR applies understanding of what information risk factor tool provides about next five years or lifetime risks			 Practical, for example: may choose to do more frequent screening could choose to get checked in less than five years makes her realise that it is important to go for screening chooses to get screened before the age of 50 enables her to take precautions to lower the risk such as changing diet would encourage her to check herself more often as risk (in next five years) is low – decides can wait five years before next screening has time to decide if she wants take any actions (such as have breasts removed) decides doesn't need more regular screening or earlier screening

Question	Answer	Marks	AO element	Guidance
	There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant. O marks No response or no response worthy of credit.			IGNORE ideas about early treatment for cancer Ethical, for example: • just because she has a higher risk does not mean she will get breast cancer • may have breasts removed for no reason • risk of surgery / risk not removing all cancerous cells • increased cost of more regular screening or unnecessary surgery • mental issues of knowing you are more at risk • not comfortable or stressed about having mastectomy • issues linked to mastectomy such as breast feeding • maybe issues with silicone implants (e.g. rejection) • consideration linked to passing on the gene IGNORE religious beliefs unless qualified

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