Higher

GCSE

Combined Science B Twenty First Century Science

J260/08: Combined science (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2025

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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.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. **Crossed-Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

Rubric Error Responses – Optional Questions
Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple-Choice Question Responses
When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth two or more marks)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional

judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add 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.

Level of response questions on this paper are **X** and **X**

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)		**Any two from:** Low stiffness / flexible ✓ (Low stiffness / flexible) idea of withstanding impact / idea of improved manoeuvrability ✓ Higher tensile strength ✓ (Higher tensile strength) to resist breakage ✓ Mid-range / lower density ✓ (Mid-range /lower density) so not too heavy ✓	2	3.2a	**ALLOW** additional correctly named properties not in the table, e.g. glass is fragile, composite is durable or hard wearing **IGNORE** lowest density **ALLOW** 1 mark for reasons why skateboard A was not chosen **ALLOW** 1 mark for reasons why skateboard B was not chosen
	(b)		Composites combine the properties of more than one material (to make a material that is better for its job) ✓	1	1.1	
	(c)		**Any one from:** Energy needed for disposal ✓ The materials can be burned (to produce electricity) ✓ The ability to reuse ✓ Idea of an impact on the environment ✓ Biodegradability of the materials ✓ Recyclability of the material ✓	1	1.1	**ALLOW** ideas of breaking the skateboard down and using the parts

	(d)	**(i)**	(Sulfur dioxide) is acidic / causes acid rain ✓ **Any one from:** Harmful to plants / animals✓ Damage to buildings ✓ Skin irritation ✓ Respiratory problems ✓ Haze ✓	**2**	**1.1**	
		(ii)	$\underline{N_2}$ ✓	**1**	**1.2**	

Question			Answer	Marks	AO element	Guidance
2	(a)		Put in a water bath ✓	1	3.3a	**ALLOW** description of a water bath **ALLOW** description of how to maintain room temperature **IGNORE** insulation
	(b)		Use a gas syringe with smaller divisions / greater resolution / AW ✓ So the measurements are closer to the true value ✓	2	3.3b	**ALLOW** stated increments if less than 5cm^3 **IGNORE** repeating measurements / precision / calculating mean
	(c)		**First check answer on answer line** **If answer = 1.75 / 1.8 (cm^3/minute) award 2 marks** 35 ÷ 20 ✓ = 1.75 ✓	2	2.2	**ALLOW** max 1 mark for 25 ÷ 20 = 1.25 **OR** 30 ÷ 20 = 1.5 if wrong sugar used for the calculation
	(d)		Idea that gills increase its surface area ✓ Idea that gills increase surface area to volume ratio ✓ greater rate of (named) gas exchange / diffusion ✓	3	2.1	**ALLOW** multicellular animals have a low surface area to volume ratio **ALLOW** rate of diffusion would be too slow (without gills)

Question			Answer	Marks	AO element	Guidance
3	(a)		**Any one from:** The idea that irradiation is exposure to (a source of) radiation but contamination is when radioactive source is on or within an object / transferred through contact ✓ Contaminated object will be (or remain) radioactive when the source is removed but irradiated objects will not ✓ Source of contamination is difficult to remove but source of irradiation is not ✓	1	1.1	
	(b)*		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)** Clear discussion of advantages and disadvantages of using gallium-67 compared to other radioactive isotopes *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)** Clear discussion of **either** advantages **or** disadvantages of using gallium-67 **and** compared to other radioactive isotopes **OR** Clear discussion of advantages **and** disadvantages without mention of other radioactive isotopes *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	6	2.1	**AO2.1** Applies knowledge and understanding of radioactive materials to discuss advantages and disadvantages **Advantages** • Idea that the half-life is relatively short and will fall back to normal background in a reasonable time • The emitted radiation needs to reach the camera though body tissues so other isotopes may not be suitable if they are emitting alpha or ~~particularly~~ beta radiation • gamma radiation is the least harmful of the three ionising radiations to tissue when injected / least ionising • greatest penetrating power of the three ionising radiation gamma radiation can exit the body and be detected by a gamma camera

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) Limited discussion of advantages **or** disadvantages of using gallium-67 without comparison to other radioactive isotopes *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.*			**Disadvantages** • The person will remain radioactive for several days rather than hours due to the half life • Potential to still damage healthy tissue such as cause mutations due to penetrating power or half life • Requires lead shielding for safety compared to aluminium/plastic for beta or paper for alpha • Idea that the health care professionals need protecting from the gamma radiation • Isolation of the patient may be needed after the images have been taken due to half life. **Aspects of the communication statement might typically be missing when:** • Irrelevant information is provided • Information presented is incoherent • Information presented is contradictory • Information presented does not have a logical structure • Use of correct terminology is not secure/present within answer
	(c)		**First check answer on answer line** **If answer = 15 (hours) award 2 marks** (a 75% fall is) 2 half lives ✓ Half-life = (30/2) = 15 (hours) ✓	**2**	**3.2b**	

Question			Answer	Marks	AO element	Guidance
4	(a)		**Any three from:** Measure the volume of acid/same volume of acid / Add the same size pieces of metal ✓ Add the (different) metal(s) to acid ✓ Identifies observations to be recorded / measure temperature change / observe bubbles / measure the volume of gas / time how long it takes to measure a specific volume of gas ✓ Describes how the results are used to determine the reactivity ✓	3	3.3a	**ALLOW** stated volume of acid **IGNORE** colour changes **ALLOW** fizzing as an alternative to bubbles **ALLOW** more vigorous reaction is more reactive
	(b)		**Any two from:** Record the start temperature/calculate temperature change ✓ Measure the volume of the copper sulphate ✓ Add a lid to the container ✓ Stir the reaction mixture ✓	2	3.3b	

Question			Answer	Marks	AO element	Guidance
5	(a)		The weight/ force due to gravity of the falling mass (is now the resultant force) ✓ Use of W = mg to calculate resultant force ✓	2	3.2b	**IGNORE** changing momentum **ALLOW** multiply mass by acceleration due to gravity
	(b)	(i)	To reduce the effect of random errors on the result ✓	1	3.2b	
		(ii)	**First check answer on answer line** **If answer = 1.2 m/s^2 award 4 marks** Selection of $v^2 - u^2 = 2as$ ✓ $v^2 - u^2 = 2 \times 1.0 \times 0.72 = (1.44)$✓ Idea that u = 0 ✓ v = 1.2 m/s^2 ✓	4	1.1 2.1 x 3	**ALLOW** 1.44 for 2 marks **ALLOW** $v^2 = 1.44$ for 3 marks **ALLOW** 1.44 on the answer line for 3 marks **ALLOW** ECF for calculated value of v^2 that is then square rooted

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	**Any one from:** Idea that phytoextraction removes CO_2 from the atmosphere ✓ Phytoextraction uses less machinery than traditional mining / less burning of fossil fuels ✓	1	1.1	
		(ii)	**Any one from:** Nanoparticles are small enough to enter the bloodstream / pass through the skin / cause health problems ✓ Nanoparticles haven't been used long enough to fully assess the risks ✓ The nanoparticles may enter the water ✓ Nanoparticles are small enough to able them to penetrate the very small organism ✓	1	3.2a	E.g. could cause cancer
	(b)		**Any three from:** Molten KCl has K^+ and Cl^- ions (only) ✓ KCl solution has H^+ (and OH^-) ions too / water is also electrolysed ✓ potassium is more reactive than hydrogen (ORA). ✓ (So) H_2 (hydrogen) is formed (instead of potassium) ✓	3	2.2	**ALLOW** K^+ ions are the only positive ions in molten potassium chloride **ALLOW** potassium ions gain electrons less readily than hydrogen ions **IGNORE** the electrode the hydrogen is formed at

Question			Answer	Marks	AO element	Guidance
7	(a)		**First check answer on answer line** **If answer = 4 (cm) award 2 marks** 2.5 (wavelengths) ✓ 10 ÷ 2.5 = 4 (cm) ✓	**2**	**3.1a**	**ALLOW** a value that rounds to 4 for 2 marks **ALLOW** 10 ÷ 2.8 x 1.2 = 4
	(b)		**First check answer on answer line** **If answer = 9.5 (Hz) award 5 marks** Use graph to find speed when depth is14 mm = 37 (cm/s) ✓ Rearrangement: frequency = wave speed ÷ wavelength ✓ Substitution: f = 37 ÷ 3.9 ✓ = 9.487… ✓ = 9.5 (Hz) (2sf) ✓	**5**	**3.1a** **2.2 x 4**	**ALLOW** 3.6 for 4 marks **ECF** from error reading the graph

Question			Answer	Marks	AO element	Guidance
8	(a)		Place the slide on the stage and illuminate the sample✓ Begin with the lowest magnification objective lens and move to higher magnification lens ✓ (Make the image clear using) coarse focus / fine focus. ✓	3	1.2	**ALLOW** any reference to being able to see the sample **ALLOW** move the stage up and down to focus (using the focus knob)
	(b)		**First check answer on answer line** **If answer = 56 award 4 marks** Area = 0.4 x 0.4 = 0.16 (mm^2) ✓ 9 ÷ 0.16 ✓ = 56.25 ✓ = 56 (nearest whole number) ✓	4	2.2	
	(c)	(i)	**Any one from:** Species A/plant from the UK woodland have a greater stomatal density on the upper and lower surfaces compared to species B, C and D/dry climates around the world ORA ✓ All plants have more stomata on their lower surface ORA ✓ The lower surface of species A/plant from woodland is the highest stomatal density of all the plants ✓	1	3.2b	**ALLOW** any suitable conclusion from the data

Question			Answer	Marks	AO element	Guidance
		(ii)	Only one plant from UK woodland / only 3 plants from dry climate / only 4 plants sampled / small sample size✓ This means the conclusions can't be generalised / may not represent the whole population ✓ **OR** No repeats were carried out. ✓ This means the data is not repeatable ✓	**2**	**3.1b**	
	(d)		**Any three from:** Variation / mutations create genetic variant which lowers stomatal number/density. ✓ Idea that plants with fewer stomata are more likely to survive ORA ✓ Idea that plants with fewer stomata are more likely to reproduce ✓ Alleles will be passed on ✓	**3**	**1.1**	

Question			Answer	Marks	AO element	Guidance
9	(a)		**Any one from:(Use of Fig 9.1)** CO_2 levels have increased✓ global temperatures have risen✓ **Any one from: (Use of Fig 9.2)** arctic sea ice has reduced✓ There is fluctuation in the data ✓ **Any one from : (ideas are linked)** Determines the correlation between the two graphs✓ Discusses the ideas of causal link is not determined by the data ✓ Recognises the graphs do not cover the same time period ✓ **Any one from:(human activity)** Increased use of fossil fuels gives more CO_2✓ Deforestation increases CO_2✓ CO_2 causes global warming ✓	**4**	**3.1b x 2** **3.1a** **3.1b**	**ALLOW** As CO_2 levels are increasing the arctic sea ice is decreasing for 3 marks **ALLOW** The Earth is warming so the arctic sea ice is decreasing for 3 marks

Question			Answer	Marks	AO element	Guidance
	(b)		**First check answer on answer line** **If answer = 88g award 5 marks** RFM pentane = (12 x 5) + (1 x 12) = 72 ✓ 28.8 ÷ 72 = 0.4 (moles) ✓ Moles of CO_2 = 0.4 x 5 = 2.0 (moles) ✓ RFM of CO_2 = 12 + (2x16) = 44 ✓ Moles x RFM / (44 x 2) = 88g ✓	**5**	**2.2**	**DO NOT ALLOW** any number divided by 28.8 in the form of a fraction as this will give 72 **ECF** 28.8 divided by their RFM **ALLOW** (5x 44) then multiplied by 0.4 for 2 marks **ALLOW** (5x their incorrect RFM) then multiplied by 0.4 for 1 marks **ECF** their calculated value for moles of pentane multiplied by 5 **ECF** for incorrectly calculated value of RFM of CO_2 **ALLOW** 1 mark If values are not used but rearranged equation is given E.g. Mass (of carbon dioxide) = moles x relative formula mass

Question			Answer	Marks	AO element	Guidance
10	(a)		To fit more haemoglobin / to carry more oxygen ✓	1	1.1a	**ALLOW** more space for oxygen / haemoglobin
	(b)		Negative correlation / as fibre (eaten) increases the risk ratio decreases ORA✓	1	3.1a	
	(c)		**Any three from:** Recommendation is based on large number of studies / lots of data ✓ A correlation doesn't mean causation ✓ Idea that there are other (named) risk factors for CVD ✓ Idea that different fruit and vegetables have different amount of fibre / suggests portion size is related to amount of fibre ✓ The studies (graph) support an increase in fibre will reduce the risk of CVD ✓ Uses the gradient of the graph or data to determine the effectiveness of the strategy suggested by scientist ✓ Other foods could provide the fibre✓ Idea that the strategy is simple and easy to follow so more will do it ✓ Eating more fruit each day could have negative effects e.g. sugars ✓	3	3.1b	**ALLOW** increasing fibre intake from 5 to 20g has the biggest impact on reducing CVD / more than 20g of additional fibre has less impact. **ALLOW** fresh fruit and vegetables may not be available if qualified, e.g. seasonal availability/affordability, access to fresh produce, access to good storage/waste'

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