

Higher

GCSE

Combined Science Physics A Gateway Science

J250/11: Paper 11 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2023

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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 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 the annotation SEEN to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
- if there is nothing written at all in the answer space
 - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
 - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.
- Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).
8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
- If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.
9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in *italics*) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in *italics*) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

Level of response question in this paper is **15**.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

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

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

13. Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science A:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

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

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

Question			Answer	Marks	AO element	Guidance
12	(a)		4 2 1 5 3 ✓	1	3.3a	
	(b)		Ball is thrown downwards. Ball is dropped from wrong height. The computer calculates the wrong velocity. Hold the ball in a clamp stand and loosen clamp to release. Repeat the same measurement 3 times. Make sure the ball is dropped through centre of light gate. Make sure ball is at the same level as the pencil line. ✓✓	2	2 × 3.3b	All 3 correct = 2 marks 1 or 2 correct = 1 mark If two lines from one source of error and one is incorrect = 0 marks for that source of error
	(c)	(i)	Diameter of ball / width of ball / length of ball ✓	1	3.3a	ALLOW size of ball IGNORE height of ball / height it was dropped from / distance ball dropped from / distance ball travelled / distance of the ball DO NOT ALLOW other quantities e.g., acceleration / velocity / speed / time / mass

		(ii) First check the answer on answer line If answer = 9.6 (m / s²) award 3 marks (Acceleration =) $\frac{(\text{final velocity})^2 - (\text{initial velocity})^2}{2 \times \text{distance}}$ OR (Acceleration =) $\frac{7.2^2 - 0}{2 \times 2.7}$ OR (Acceleration =) $\frac{7.2^2}{2 \times 2.7} \checkmark$ (Acceleration =) $\frac{51.84}{5.4} \checkmark$ (Acceleration =) 9.6 (m / s²) $\checkmark$	3	1.2 2 × 2.1	ALLOW substitution into unrearranged equation e.g., $7.2^2 - 0 = 2 \times a \times 2.7$ or $7.2^2 = 2 \times a \times 2.7$ If no other marks awarded ALLOW for 1 mark any of the following numbers seen: 51.84 or 51.8 or 5.4
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Question			Answer	Marks	AO element	Guidance
13	(a)		First check the answer on answer line If answer = 6 (V) award 3 marks (Potential difference =) current $\times$ resistance ✓ (Potential difference =) 0.6×10 ✓ (Potential difference =) 6 (V) ✓	3	1.2 2.1 2.1	ALLOW (V =) IR If no other marks awarded ALLOW the answer 12 (V) or 24 (V) seen anywhere in the answer for 1 mark
	(b)		Resistors (between X and Y) are in <u>parallel</u> ✓ More loops/branches for <u>current</u> to flow through / less <u>current</u> in each branch / AW ✓	2	2 $\times$ 1.1	ALLOW resistance in <u>parallel</u> is less than resistance in series / 'adding another component in <u>parallel</u> circuit means the resistance drops' ALLOW two pathways for <u>current</u> / the <u>current</u> is split / current is shared
	(c)		1.2 (A) ✓	1	2.2	
	(d)		The current at W is equal to the current at X ✓	1	1.2	ALLOW any indication of the first box selected e.g., x or circling but ticking takes precedence DO NOT ALLOW more than one box ticked

	(e)		First check the answer on answer line If answer = 3.6 (W) award 3 marks (Power =) (current)² × resistance ✓ (Power =) (0.6)² × 10 ✓ (Power =) 3.6 (W) ✓	3		1.2 ALLOW (P=)VI 2 × 2.1 ALLOW 6 × 0.6 or (a) × 0.6 ALLOW ECF from (a) e.g., (12 V × 0.6 =) 7.2 (W) for 3 marks (24 V × 0.6 =) 14.4 (W) for 3 marks
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Question			Answer	Marks	AO element	Guidance
14	(a)		Point could be an anomaly / point does not lie on the line (of best fit) / could be an error in the reading ✓	1	3.1b	ALLOW point is an outlier ALLOW idea that a gradient cannot be calculated from a point / gradient is a change / point is not a change
	(b)		First check the answer on answer line If answer = 0.19 (°C / s) award 3 marks (Gradient =) $\frac{52 - 18}{180}$ ✓ (Gradient =) 0.189 ✓ (Gradient =) 0.19 (°C / s) (2 sf) ✓	3	1.2 2.1 1.2	ALLOW gradient in the range of 0.18 to 0.20 but given to the wrong number of significant figures e.g., 0.1846 or 0.2 for 2 marks ALLOW gradient on answer line as 0.18 or 0.20 for 3 marks ALLOW one mark for clear evidence of an incorrect answer correctly rounded to 2 significant figures e.g., 723 changed to 720 If no other marks awarded ALLOW any correct triangle on graph, provided it covers half or more than half of the grid

	(c)	(i)	<u>Temperature</u> of the room / <u>temperature</u> of the water before heating ✓	1	3.2a	ALLOW initial <u>temperature</u> / <u>temperature</u> at start IGNORE just ‘temperature’
		(ii)	Rate of change of <u>temperature</u> / <u>temperature</u> change per second / AW ✓	1	3.2b	Answer requires a rate idea ALLOW how fast <u>temperature</u> rises / rate of <u>temperature</u> increase IGNORE ‘rate of temperature increase of temperature by seconds’ / it’s linear / goes up equally / consistency of how the temp increases
	(d)		First check the answer on answer line If answer = 42 000 (J) award 3 marks (Temperature rise =) 0.25×200 OR (Temperature rise =) $50\ (^{\circ}\text{C})$ ✓ (Energy transferred =) $0.2 \times 4200 \times 50$ ✓ (Energy transferred =) 42 000 (J) ✓	3	2.2 2 × 2.1	ALLOW 42 with kJ If no other marks awarded ALLOW 1 mark for 210 on the answer line
	(e)		First check the answer on answer line If answer = 160 (W) award 3 marks (Power =) $\frac{\text{work done}}{\text{time}}$ ✓ (Power =) $\frac{32000}{200}$ ✓ (Power =) 160 (W) ✓	3	1.2 2.1 2.1	ALLOW energy transferred for work done

Question			Answer	Marks	AO element	Guidance
15	*		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) Detailed conclusions from graph AND detailed description of motion using free body force diagram (FBFD) <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) Detailed conclusions from graph AND basic description of motion using FBFD OR Basic conclusions from graph AND detailed description of motion using FBFD <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) Basic conclusions from graph OR basic description of motion using FBFD <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 x 1.1 3 x 3.1a	AO3.1a – Analyses information and idea to interpret the distance-time graph - Initially, velocity is zero - Gradient increases / graph is non linear - So velocity increases - Acceleration increases - Gradient increases at a decreasing rate - Acceleration decreases - Eventually, gradient is constant / a straight line - No acceleration - As the skydiver reaches terminal velocity AO1.1 – Demonstrates knowledge and understanding of forces to explain the distance-time graph - Weight remains constant - Unbalanced force on skydiver (at start) - Weight greater than drag (at start) - So drag increases - So resultant force decreases - Drag = weight (at end) IGNORE reference to the parachute / after the parachute has opened

Question			Answer	Marks	AO element	Guidance
16	(a)		First check the answer on answer line If answer = 0.12 (J) award 2 marks (Gravitational potential energy =) $0.015 \times 10 \times 0.8 \checkmark$ (Gravitational potential energy =) 0.12 (J) $\checkmark$	2	2 × 2.1	
	(b)	(i)	Energy transferred to a thermal store $\checkmark$ Work done against friction / work done against air resistance $\checkmark$	2	2 × 3.2a	ALLOW (idea that) heat is dissipated to the surroundings / heat to 'lost' to the surroundings ALLOW (idea that) energy is transferred to sound ALLOW (idea that) there is friction (between marble and track) / air resistance (as the marble moves)
		(ii)	First check the answer on answer line If answer = 2 (m / s) award 3 marks (Speed²) = $\frac{2 \times \text{kinetic energy}}{\text{mass}}$ OR (Speed²) = $\frac{\text{kinetic energy}}{\frac{1}{2} \text{ mass}} \checkmark$ (Speed²) = $(2 \times 0.03) \div 0.015 \checkmark$ (Speed =) 2 (m / s) $\checkmark$	3	1.2 2.1 2.1	ALLOW correct rearrangement of equation to make either speed² or speed the subject ALLOW 4 (m / s) on the answer line for 2 marks

	(c)	First check the answer on answer line If answer = 0.04 (m / s) award 3 marks Statement of conservation of momentum OR $5 \times 0.1 = (20 \times v) - (5 \times 0.06) \checkmark$ $20 \times v = 0.8$ OR $(v =) \frac{0.8}{20} \checkmark$ $(v =) 0.04 \text{ (m / s)} \checkmark$	3	1.2 2 × 2.1	If no other marks awarded ALLOW 1 mark for any of the following numbers seen anywhere in the answer: $(5 \times 0.1 =) 0.5$ or $(5 \times 0.06 =) 0.3$ or 0.8
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