

Foundation

GCSE

Combined Science Physics A Gateway Science

J250/05: Paper 5 (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.

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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 read.
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 on this paper is **14**.

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**.

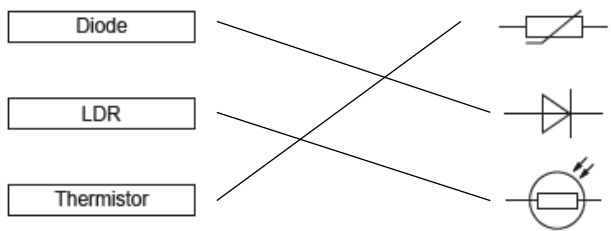
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

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.

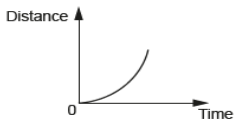
For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g., circled or underlined.

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

Question			Answer	Marks	AO element	Guidance
11	(a)		<p>Circuit component Symbol ✓✓</p> 	2	2 × 1.1	<p>All 3 correct = 2 marks 1 or 2 correct = 1 mark</p> <p>If two lines from one component and one is incorrect = 0 marks for that component</p>
	(b)		<p>Increases AND Decreases ✓ Decreases ✓</p>	2	2 × 1.2	
	(c)		<p>Ammeter in series with resistor ✓ Voltmeter in parallel with resistor ✓</p>	2	2 × 1.2	<p>ALLOW incorrect but recognisable symbols for ammeter/voltmeter/resistor</p> <p>ALLOW ammeter in either gap for 1 mark DO NOT ALLOW ammeter in cell or resistor</p> <p>ALLOW voltmeter in parallel with cell for 1 mark</p>
	(d)		<p>First check the answer on answer line If answer = 1.5 (A) award 3 marks</p> <p>Rearrange: (current =) potential difference ÷ resistance ✓ (current =) $4.5 \div 3$ ✓ (current =) 1.5 (A) ✓</p>	3	<p>1.2 2 × 2.1</p>	<p>ALLOW equation in words or symbols</p>

	(e)	(i)	<p>(Both) lamps go off / lamp B goes off ✓</p> <p>Circuit is incomplete ✓</p>	2	2 × 2.2	<p>ALLOW answers for what happens and the reason on any line</p> <p>ALLOW no lamps light / lamp B does not light</p> <p>IGNORE lamp will go off</p> <p>IGNORE lamp B/lamps dim</p> <p>DO NOT ALLOW this mark if lamp B stays on</p> <p>ALLOW circuit is broken / there is a gap in the circuit / no current in circuit / circuit not connected / electrons cannot flow</p> <p>IGNORE circuit will not work / it is a series circuit / the lamps are in series</p>
		(ii)	<p>Lamp B is/stays lit ✓</p> <p>Circuit is (still) complete for lamp B / lamp B is in a separate branch ✓</p>	2	2 × 2.2	<p>ALLOW answers for what happens and the reason on any line</p> <p>ALLOW lamp B gets brighter / lamp B stays the same brightness</p> <p>DO NOT ALLOW this mark if lamp B goes off</p> <p>ALLOW there is (still) current in lamp B</p> <p>IGNORE lamp B is (connected) in parallel</p> <p>DO NOT ALLOW more current goes to lamp B</p>
	(f)		<p>The graph is linear when the potential difference is less than 4V ✓</p> <p>The ratio of current : potential difference is unchanged from 0V to 5V ✓</p>	2	2 × 3.2b	<p>If 3 boxes ticked and 1 or 2 correct = 1 mark</p> <p>If 4 or more boxes ticked = 0 marks</p>

Question			Answer	Marks	AO element	Guidance
12	(a)		Stopwatch / stopclock ✓	1	1.2	ALLOW timer/chronometer IGNORE watch/clock/mobile phone
	(b)		First check the answer on answer line If answer = 42 000 (J) award 2 marks (Energy transferred = mass × SHC × temperature rise) (Energy transferred =) $0.2 \times 4200 \times 50$ ✓ (Energy transferred =) 42 000 (J) ✓	2	2 × 2.1	
	(c)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 200 (W) award 2 marks (Power =) $40\,000 \div 200$ ✓ (Power =) 200 (W) ✓	2	2 × 2.1	
	(d)	(i)	Steeper line / bigger gradient / bigger slope / takes the least/less time to reach 50°C ✓	1	3.1b	ALLOW takes less time to heat up / gets hot faster / increases in temperature more quickly IGNORE it/line is steep / it/line increases in shorter time / it/line is higher
		(ii)	They used too much water ✓	1	3.2a	If more than one box ticked = 0 marks

Question			Answer	Marks	AO element	Guidance
13	(a)		40 (s) ✓	1	2.2	
	(b)		70 (s) ✓	1	2.2	ALLOW 68 (s) to 72 (s)
	(c)		<p>First check the answer on answer line If answer = 0.94 (m / s) award 4 marks</p> <p>Rearrange: (Speed =) distance ÷ time ✓</p> <p>(Speed =) $150 \div 160$ ✓</p> <p>(Speed =) 0.9375 ✓</p> <p>(Speed =) 0.94 (m / s) (2sf) ✓</p>	4	<p>1.2</p> <p>2.1</p> <p>2.1</p> <p>1.2</p>	<p>ALLOW equation in words or symbols ALLOW incorrect values for distance ÷ time for this mark only if it is clear that the equation has been rearranged correctly using these values</p> <p>ALLOW (148 to 152) ÷ 160</p> <p>ALLOW 0.925 to 0.95</p> <p>ALLOW 0.93 or 0.95 ALLOW this mark for evidence of an incorrect answer (correctly rounded) to two significant figures</p> <p>If no marks scored ALLOW 150 and 160 seen for 1 mark</p>
	(d)	(i)	<p>3rd box ticked ✓</p> 	1	1.1	If more than one box ticked = 0 marks
		(ii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.4 (m / s²) award 2 marks</p> <p>(Acceleration =) $1.2 \div 3$ ✓</p> <p>(Acceleration =) 0.4 (m / s²) ✓</p>	2	2 × 2.1	
		(iii)	Normal contact force ✓	1	1.1	If more than one box ticked = 0 marks

Question	Answer	Marks	AO element	Guidance
14 *	<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>Detailed description of method and a detailed explanation of the graph</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>Detailed description of method and a basic explanation of the graph OR Basic description of method and a detailed explanation of the graph OR Clear description of method and a clear explanation of the graph</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>Basic description of method or a basic explanation of the graph</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>	6	2 × 3.3a 2 × 3.1a 2 × 1.2	<p>AO3.1a - Analyse information by interpreting the graph of the electromagnet strength</p> <ul style="list-style-type: none"> • As number of turns increases, strength (of electromagnet) increases • Strength (of electromagnet) increases at a steady rate / linear relationship (between number of turns and strength of electromagnet) • Directly proportional relationship (between number of turns and strength of electromagnet) <p>AO1.2 and AO3.3a - Analyse information and ideas by developing a method for the electromagnet experiment</p> <ul style="list-style-type: none"> • Wind (a fixed number of turns of) wire around the soft iron core • Use insulated wire for coil (to prevent short circuits) • Pass current through the coil • (Current in wire produces) magnetic field around wire • (Current-carrying) coil becomes an electromagnet • Measure strength of magnetic field • Use paperclips/pins to measure strength of electromagnet • Count how many (steel) paperclips/pins are attracted

			0 marks <i>No response or no response worthy of credit.</i>			<ul style="list-style-type: none"> • The more paperclips/pins attracted, the stronger the magnet/magnetic field • Measure how much iron filings are attracted • (Repeat experiment for) different number of turns of wire • Repeat and calculate mean for each number of turns • Measure current with ammeter • Keep current constant • Use same core • Record measurements of number of turns and number of paperclips/pins in a table
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Question			Answer	Marks	AO element	Guidance
15	(a)		Electrons ✓ (Move from the) gold leaf electroscope (to the) positively charged rod ✓	2	1.1 2.1	ALLOW gold or leaf or electroscope for gold leaf electroscope ALLOW rod for positively charged rod
	(b)		Like charges repel / same charges repel / positive charges repel ✓	1	1.1	ALLOW it/gold leaf repels from the positive charge / protons repel ALLOW same charges push away (as idea of repel) IGNORE do not attract / same charges cause a force
	(c)		Gold leaf drawn downwards and (nearly) vertical ✓ Electrons flow from the Earth ✓	2	2 × 2.1	ALLOW description on answer line e.g., leaf drops (down) / leaf returns to original/start position ALLOW (gold leaf drawn with) arrow indicating downwards direction IGNORE any charges drawn ALLOW (negative) charges for electrons ALLOW move or transfer for flow ALLOW any correct flow of electrons e.g., electrons flow from finger / electrons flow to cap / electrons flow to electroscope IGNORE vague descriptions e.g., the electrons are lost / it discharges / neutralises DO NOT ALLOW protons moving / positive charges moving / positive electron moving

Question			Answer	Marks	AO element	Guidance
16	(a)		4 2 1 5 3 ✓	1	3.3a	
	(b)		<p>✓✓</p>	2	2 × 3.3b	<p>All 3 correct = 2 marks 1 or 2 correct = 1 mark</p> <p>If two lines from one source of error and one is incorrect = 0 marks for that source of error</p>
	(c)	(i)	Diameter of ball / width of ball / length of ball ✓	1	3.3a	<p>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</p>

		<p>(ii) First check the answer on answer line If answer = 9.6 (m / s²) award 3 marks</p> <p>(Acceleration =) $\frac{(\text{final velocity})^2 - (\text{initial velocity})^2}{(2 \times \text{distance})}$</p> <p>OR</p> <p>(Acceleration =) $\frac{7.2^2 - 0}{2 \times 2.7}$</p> <p>OR</p> <p>(Acceleration =) $\frac{7.2^2}{2 \times 2.7} \checkmark$</p> <p>(Acceleration =) $\frac{51.84}{5.4} \checkmark$</p> <p>(Acceleration =) 9.6 (m / s²) $\checkmark$</p>	3	<p>1.2</p> <p>2 × 2.1</p>	<p>ALLOW substitution into unrearranged equation e.g., $7.2^2 - 0 = 2 \times a \times 2.7$ or $7.2^2 = 2 \times a \times 2.7$</p> <p>If no other marks awarded ALLOW for 1 mark any of the following numbers seen: 51.84 or 51.8 or 5.4</p>
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