

OCR • GCSE COMBINED SCIENCE A (GATEWAY) J250

Physics — Higher Tier, Paper 1

June 2025 exam series

MARK SCHEME

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Higher

GCSE

Combined Science Physics A Gateway Science

J250/11: Paper 11 (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.

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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 on this paper is **Q13***

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	D	1	2.1	A: $90 \div 9000$ B: $9 \div 90$ C: $90 \div 9$ D: $9000 \div 90$
2	C	1	2.1	A: $450 \times (10 \div 100)$ B: $450 \times (10 \div 80)$ C: $450 \times 10 \times 80$ D: $450 \times 10 \times 100$
3	D	1	2.1	A: 3×0.15 B: $0.15 \times (3 \times 60)$ C: $0.15 \times (60 \times 60)$ D: $3 \times 60 \times 60 \times 0.15$
4	B	1	2.1	
5	D	1	2.1	A: $Q \div t$ B: Vt C: $Q \div V$ D: QV
6	B	1	2.2	
7	C	1	2.1	
8	B	1	2.2	
9	B	1	2.1	A: $-10 \div 50$ B: $-50 \div 5000$ C: $+50 \div 5000$ D: $+10 \div 50$
10	C	1	2.1	A: KE proportional to $\sqrt{v}$ B: KE proportional to v C: correct D: incorrect re-arrangement of KE formula

Question			Answer	Marks	AO element	Guidance
11	(a)		Induced ✓	1	1.1	ALLOW temporary
	(b)		Plotting compasses ✓ Iron filings ✓	2	2 × 1.2	ALLOW in either order ALLOW answers if circled or underlined but answer line takes precedence ALLOW compass(es) for plotting compasses ALLOW iron or filings for iron filings
	(c)		Observe the needle direction at different points on the Earth's surface ✓	1	3.3a	ALLOW (idea of) using dipping compass at different places (on Earth's surface)
	(d)		Any two from: Field strength varies from 30 (μT) to 60 (μT) / has a range of 30 (μT) ✓ Field is stronger at A and E / weaker at C ✓ Field is stronger at poles / weaker at equator/away from poles ✓	2	2 × 3.2b	 ALLOW north and south for poles ALLOW the magnetic field decreases from the north (pole) to the equator and increases from the equator to the south (pole) for 2 marks

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	(Idea that) <u>negative</u> charges are spread throughout the atom ✓ <u>Positive</u> charge in the main body/substance of the atom ✓	2	2 × 1.1	ALLOW electrons for negative charge ALLOW (idea that) atom is ball/cloud/sphere/sea of <u>positive</u> charge ALLOW (idea that) the electrons/ <u>negative</u> charges are spread throughout the ball of <u>positive</u> charge for 2 marks ALLOW answers from labelled diagram
		(ii)	Technology not available / newer evidence had not yet been found ✓	1	2.2	ALLOW scientists had not raised these questions
	(b)	(i)	Any two from: To share with other scientists / other scientists can see his work / AW ✓ So that results and/or explanations could be checked / peer reviewed / AW ✓ To document the event (in history) / so people could not steal his ideas / to gain credit for his work / recognise his work / AW ✓ Other scientists can develop his ideas / track progress / AW ✓	2	2 × 2.2	IGNORE to become famous

		(ii)	Physicist Bohr Marsden Change neutrons electron orbits nucleus ✓	1	1.1	IGNORE line joining Marsden to nucleus DO NOT ALLOW any other lines drawn
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Question		Answer	Marks	AO element	Guidance
13	*	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 comparison of accelerations And Detailed comparison of distances travelled <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) Clear comparison of accelerations And Basic comparison of distances travelled Or Basic comparison of accelerations And Clear comparison of distances travelled <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 comparison of accelerations Or Basic comparison of distances travelled <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 × 1.1 3 × 2.1	AO 1.1 Demonstrate knowledge and understanding of velocity-time graphs For example: • Gradient gives acceleration • Area enclosed is distance travelled AO 2.1 Apply knowledge and understanding of velocity-time graphs For example: • B has greater gradient / ORA • B has greater acceleration / ORA • Greater gradient means greater acceleration / ORA • A is 1 (m/s²) and B is 1.5 (m/s²) • B encloses a greater area / ORA • B travels further / ORA • Greater area means greater distance / ORA • A travels 45.5 (m) and B travels 48 (m) ALLOW calculations reversed e.g. B is 1 (m/s²) and A is 1.5 (m/s²) and/or B travels 45.5 (m) and A travels 48 (m)

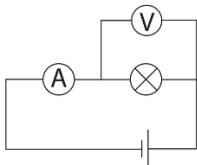
Question			Answer	Marks	AO element	Guidance
14	(a)		(Fleming's) left hand rule ✓	1	1.1	
	(b)		First check the answer on the answer line If answer = 2.3×10^{-7} (N) award 3 marks Conversion of units: (current = $500 \div 1000 =$) 0.5 A ✓ Substitution: (force =) $1 \times 10^{-6} \times 0.5 \times 0.45$ ✓ Evaluation: (force =) 2.3×10^{-7} (N) ✓	3	3 × 2.1	ALLOW $1 \times 10^{-6} \times 500 \times 0.45$ for 1 mark ALLOW 2.25×10^{-7} (N) ALLOW 2.25×10^n or 2.3×10^n for 2 marks
	(c)	(i)	(Current is halved) 250 (mA) ✓	1	2.1	ALLOW 0.25 A
	(c)	(ii)	Force is unchanged / length is doubled and current is halved ✓ Same speed ✓	2	2 × 2.1	ECF from (i): (Current more than 250 e.g. 1000) Force is increased = 1 mark Greater speed = 1 mark (Current less than 250) Force is decreased = 1 mark Less speed = 1 mark

Question			Answer	Marks	AO element	Guidance
15	(a)		Measure the mass using the (digital) balance ✓ Add the ring to water into the measuring cylinder ✓ Find the increase in water volume ✓ Calculate density using $m \div v$ ✓	4	4 × 1.2	DO NOT ALLOW use of Eureka can ALLOW measure the volume of water that overflows ALLOW measure volume of water with ring and then volume of water without ring
	(b)	(i)	Mostly gold ✓	1	3.2a	
	(b)	(ii)	Density is not equal to pure gold or pure copper ✓ Density is nearer to pure gold than to pure copper ✓	2	2 × 3.2a	ALLOW density is between pure gold and pure copper ALLOW 1600 is closest to 1800 ALLOW (idea that) density is just under 1800 IGNORE density is under 1800
	(c)		In solid (gold) particles are (more) closely packed (than they are in liquid gold) / ORA ✓ So there are more particles in a given volume / a given number of particles occupies a smaller volume / ORA ✓	2	2 × 1.1	Assume answer is about solid gold particles unless liquid is stated ALLOW alternative words for '(more) closely packed' e.g. (more) compact / tighter ALLOW more space between particles in liquid (gold) / ORA ALLOW other description to relate mass and volume e.g. a solid has higher mass in the same volume / a liquid has the same mass in a larger volume

Question			Answer	Marks	AO element	Guidance
16	(a)		If a ruler or distance used: Any four from: Allow masses to fall (and accelerate the car) ✓ Repeat using different masses ✓ Timer/stopwatch and ruler ✓ Measure distance and time ✓ Use initial speed as 0 ✓ If a balance used: Any four from: Allow masses to fall (and accelerate the car) ✓ Measure mass of car ✓ Use a balance ✓ (Resultant) force is the weight of the masses ✓ Use of $F = ma$ ✓ If ticker tape is used: Any four from: Allow masses to fall (and accelerate the car) ✓ Repeat using different masses ✓ Ticker tape timer and ruler ✓ Measure distance and time ✓ Use initial speed as 0 ✓ If idea of light gates/data loggers are used: Any four from: Allow masses to fall (and accelerate the car) ✓ Repeat using different masses ✓ Light gates ✓ Set/program light gates to measure acceleration ✓ Read acceleration from the light gate output ✓	4	4 × 1.2	If more than one method given select the method which gives the highest mark IGNORE measuring stick for ruler IGNORE measuring stick for ruler

	(b)	(i)	Friction ✓	1	1.1	
		(ii)	Any one from: Lubricate car wheels/pulley/ramp (surface) ✓ Raise/tilt the ramp (slightly) to create a downwards slope ✓	1	3.3b	ALLOW lubricate (the parts of the equipment that are touching) / add oil / use smoother (surface) / change the material IGNORE make it flat IGNORE other methods that change the apparatus e.g. blow air through holes, add ball bearings, use a toy with a smaller mass, raise the string

Question			Answer	Marks	AO element	Guidance
16	(c)		Any two from: Repeat readings ✓ Use a greater range of forces/masses ✓ Use smaller increments of force/mass ✓	2	2 × 3.3b	ALLOW repeat the experiment/investigation ALLOW use force/mass outside the range e.g. use 1 N / use 0.1 kg ALLOW use a different force/mass within the range e.g. use 0.5 N
	(d)		First check the answer on the answer line If answer = 2.04 (m/s²) award 1 mark 2.04 (m/s ²) ✓	1	3.1b	
	(e)		Scalar ✓	1	1.1	IGNORE scale

Question			Answer	Marks	AO element	Guidance
17	(a)		 Ammeter in series with lamp and cell ✓ Voltmeter in parallel with lamp ✓	2	2 × 1.2	Mark intent IGNORE lines through ammeter and voltmeter symbols / gaps in connecting lines ALLOW old symbol for lamp DO NOT ALLOW battery for cell / incorrect symbols / extra components ALLOW voltmeter in parallel with their symbol for a lamp
	(b)		First check the answer on the answer line If answer = 2.5 (A) award 2 marks $(I =) 6(.0) \div 2.4$ ✓ $(I =) 2.5$ (A) ✓	2	2 × 2.1	
	(c)		Each additional lamp is added in parallel ✓ Because resistance is decreased (with each lamp added) ✓	2	3.2b 3.1a	ALLOW a diagram which shows lamps in parallel DO NOT ALLOW lamps in series

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