

OCR • GCSE COMBINED SCIENCE A (GATEWAY) J250

Physics — Foundation Tier, Paper 2

June 2025 exam series

MARK SCHEME

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Foundation

GCSE

Combined Science Physics A Gateway Science

J250/06: Paper 6 (Foundation 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 **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	C	1	1.1	
2	B	1	2.2	
3	B	1	1.1	
4	D	1	1.2	A: $5 \times 10^{-3} = 0.005$ B: $5 \times 10^0 = 5$ C: $5^3 = 125$ D: $5 \times 10^3 = 5000$
5	B	1	1.2	
6	A	1	2.1	
7	D	1	2.2	
8	B	1	1.2	
9	C	1	2.1	
10	C	1	2.1	A: $10 \div 2 = 5$ B: $10 = 10$ (no change) C: $10 \times 2 = 20$ D: $10^2 = 100$

Question			Answer	Marks	AO element	Guidance
11	(a)		B ✓	1	3.1	
	(b)		First check the answer on the answer line If answer = 1.36 (m) award 3 marks (wavelength =) wave speed $\div$ frequency ✓ (wavelength =) $340 \div 250$ ✓ (wavelength =) 1.36 (m) ✓	1 1 1	1.3 2.1 2.1	Rearrange Substitute Evaluate ALLOW 1 mark for correct substitution into unarranged equation
	(c)		Longitudinal ✓ Particles ✓	1 1	1.1 1.2	

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	Infra-red radiation ✓	1	2.1	
		(ii)	(Human) eyes can (only) detect a limited range of the electromagnetic spectrum / ✓	1	2.1	ALLOW eyes cannot detect infra-red/heat/x-rays ALLOW the object is not emitting/reflecting visible light IGNORE (there is) no light/ cannot see in the dark
	(b)	(i)	(UV, X-ray and gamma) are ionising ✓	1	1.1	ALLOW (can cause) cell/tissue/named organ/DNA damage ALLOW (lead to) cancer or mutation IGNORE harm
		(ii)	ultra-violet sterilising surgical equipment X-ray detecting fake bank notes gamma making images of bones ✓✓	2	2 × 1.2	ALLOW 2 marks for all correct ALLOW 1 mark for one or two correct lines DO NOT ALLOW more than one line from the same type of wave

Question			Answer	Marks	AO element	Guidance
13	(a)		+6 ✓	1	2.1	
	(b)		Fewer neutrons than ✓ The same number of protons as ✓	2	2 × 2.1	
	(c)		(Proton number of N is) 7 ✓ (Nucleon number of beta particle is) 0 ✓	2	2 × 2.1	
	(d)		Any one from: (Half-life is) the time it takes for half of the number of (unstable) nuclei to decay ✓ (Half-life is) the time it takes for half of the (original) radioactive material to decay ✓ (Half-life is) the time it takes for the activity (of a sample of an isotope) to halve ✓ (Half-life is) the time it takes for the count rate (of a sample of an isotope) to halve ✓	1	1.1	ALLOW atoms for nuclei ALLOW original mass / (mass of) carbon-14 for radioactive material ALLOW <u>rate of</u> decay for activity ALLOW radioactivity for count rate
	(e)		alpha beta gamma a few sheets of paper a few centimetres of lead a few millimetres of aluminium ✓✓	2	2 × 1.1	ALLOW 2 marks for all correct ALLOW 1 mark for one or two correct lines. DO NOT ALLOW more than one line from the same type of radiation

Question			Answer	Marks	AO element	Guidance
14	(a)	(i)	Chemical (energy store in the battery) ✓	1	2 × 2.1	ALLOW Electrical or Currents
			Electrical currents ✓	1		
		(ii)	First check the answer on the answer line If answer = 168 000 (J) award 3 marks (change in temperature =) $100 - 20 = 80$ ✓ (change in thermal energy =) $0.5 \times 4200 \times 80$ ✓ (change in thermal energy =) 168 000 (J) ✓	1 1 1	3 × 2.1	Calculating change of temp Substitution into SHC formulae Evaluation (ALLOW ECF if mass is 500g) ALLOW 42 000 J or 210 000 J for 2 marks (where students used 20 °C or 100 °C in the calculation)
		(iii)	(Idea that) some energy is dissipated. ✓	1	3.1b	ALLOW lost to surroundings/environment/kettle ALLOW energy used in evaporation
	(b)	(i)	3 (minutes) ✓	1	3.1a	CON incorrect unit
		(ii)	B ✓ (Idea that) greater decrease in temperature / loses energy faster ✓	2	3.2a 3.2b	If cup A is chosen, zero marks for question ALLOW heat for energy ALLOW line is steeper (for B)

Question			Answer	Marks	AO element	Guidance
		(iii)	Any two from: (Same) <u>starting</u> temperature ✓ (Same) volume of water ✓ (Same) room temperature ✓ (Same) size/volume/shape/surface area of cup ✓ (Same) thickness of cup ✓ Both have same lids or both don't have lids ✓	2	2 × 3.3b	IGNORE temperature unless qualified IGNORE heat ALLOW (same) amount/mass of water DO NOT ALLOW material of cup/same cup
		(iv)	(Temperature) will be greater (after 5 minutes) ✓ (Idea that) insulation reduces (unwanted) energy transfer / AW ✓	2	2 × 3.2a	ALLOW (Temperature) will decrease less / AW ALLOW A will be greater than 60°C <u>and</u> B greater than 51°C ALLOW stays warmer (longer) ALLOW lines less steep ALLOW <u>less</u> heat/energy is wasted/lost/dissipated ALLOW takes longer for energy/heat to be lost ALLOW <u>more</u> heat is trapped ALLOW prediction/reason anywhere on answer lines

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 description of factors affecting thinking distance and braking distance And Detailed explanation (braking and thinking) of how the driver's stopping distance is affected <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 description of factors affecting thinking distance or braking distance And Clear explanation (braking or thinking) of how the driver's stopping distance is affected Or Basic description of a factor affecting thinking distance and braking distance And Detailed explanation (braking and thinking) of how the driver's stopping distance is affected <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i>	6	3 × 1.1 3 × 3.2a	Indicative content may include: AO1.1 Demonstrate knowledge and understanding of scientific ideas relating to factors affecting thinking distance and braking distance: - stopping distance = thinking distance + braking distance - thinking distance is dependent on reaction time / concentration / age - thinking distance is dependent on alcohol, drugs - braking distance is dependent on braking force / condition of road - braking distance is dependent on mass of vehicle / condition of tyres/brakes - braking distance and thinking distance are dependent on initial speed AO3.2a Analyse information and ideas to make judgments about stopping distances and driving conditions: Driver is tired.... - reaction time is greater - thinking distance is greater Road is wet... - less friction/ braking force is less/ car could slide

		Level 1 (1–2 marks) Basic description of a factor affecting thinking distance or braking distance Or Basic explanation of how the driver's thinking or braking distance is affected <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>			braking distance is greater (Therefore stopping distance is greater)
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Question			Answer	Marks	AO element	Guidance
16	(a)		Alternating voltage is (constantly) changing direction and direct voltage has one direction ✓	1	1.1	ALLOW potential difference or current instead of voltage. ALLOW a.c. and d.c. for of alternating and direct ALLOW alternating switches between + and –, but direct does not switch and stays + or – ALLOW alternating current changes direction, direct current does not change direction ✓ ALLOW alternating voltage goes back and forth, forwards and backwards but d.c just goes one way IGNORE a.c. alternates, varies, oscillates, changes IGNORE d.c. stays the same
	(b)	(i)	First check the answer on the answer line If answer = 1.1 (MW) award 4 marks (power =) $730^2 \times 2.0$ ✓ (power =) 1 065 800 (W) ✓ (power =) 1 100 000 (W) ✓ or 1.07 (MW) ✓ (power =) 1.1 MW ✓	4	2.1 2.1 1.2 2.1	ALLOW 1.07 or 1.0658 for 3 marks ALLOW 1 100 000 (W) for 3 marks Accurate substitution Correct evaluation answer Correct conversion to MW Correct conversion given to 2 significant figures

Question			Answer	Marks	AO element	Guidance
16	(b)	(ii)	First check the answer on the answer line If answer = 0.98 award 3 marks If answer is incorrect then maximum 2 from: (useful output =) $8000 - 160$ (W) ✓ (useful output =) 7840 (W) ✓ (efficiency =) $(7840) \div 8000$ ✓	3		ALLOW 98% ALLOW other simple fractions e.g. 49/50 2.1 Method for useful output energy 2.1 Correct value for useful output energy 1.2 Substitute correctly for total input into efficiency equation
		(iii)	increase the voltage/p.d ✓ Decreases/ lower current ✓ Less energy lost / less energy dissipated/ less heating of wires/less power loss ✓	3	3 × 1.2	ALLOW high voltage (output) ALLOW low current (output) ALLOW less heat lost IGNORE save energy IGNORE references to speed of transfer DO NOT ALLOW no energy loss
	(c)		Completes the circuit (allowing current in the circuit) / AW ✓	1	1.1	IGNORE it is at 0v or it does not supply energy ALLOW carries current from the appliance ALLOW carries current to the source

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