

OCR • GCSE COMBINED SCIENCE A (GATEWAY) J250

Chemistry — Higher Tier, Paper 2

June 2025 exam series

MARK SCHEME

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Higher

GCSE

Combined Science Chemistry A Gateway Science

J250/10: Paper 10 (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. **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 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 **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	B	1	2.1	
2	B	1	2.2	ALLOW 0.70 or 0.7
3	C	1	1.2	
4	C	1	1.1	
5	A	1	1.2	
6	D	1	1.1	
7	B	1	1.2	
8	B	1	1.1	
9	B	1	2.2	
10	C	1	2.1	

Question			Answer	Marks	AO element	Guidance
11	(a)		2 (H ₂ O) ✓ (1) O ₂ ✓	2	1.1 2.2	DO NOT ALLOW 2O or O ²
	(b)		Test – glowing splint ✓ Result – (the splint) relights ✓	2	2 × 1.2	Read answer as a whole DO NOT ALLOW splint / burning splint IGNORE blown out splint
	(c)	(i)	Enzyme(s) ✓	1	1.1	
		(ii)	Increases rate of reaction / reaction is faster / reaction speeds up / oxygen is produced quicker ✓ Reduces/lowers activation energy / reduces energy needed for reaction to occur (by providing an alternative route for the reaction) ✓	2	2 × 2.1	ALLOW bubbles faster IGNORE bubbles more NOTE: reaction is fast is insufficient DO NOT ALLOW more energy needed IGNORE collisions NOTE: activation energy is low is insufficient
		(ii)	It is decreased. ☐ It is increased. ☐ It stays the same. ☒ ✓	1	2.1	
	(d)	(i)	First check the answer on the answer line If answer = 24 (cm²) award 2 marks (surface area of 1 face =) $2 \times 2 / 2^2$ ✓ (surface area of cube = 4×6 =) 24 (cm ²) ✓	2	2 × 2.2	IGNORE volume calculations e.g. $2 \times 2 \times 2 / 4 \times 2 / 2^2 \times 2^2$ ALLOW 4 with no other working ECF from incorrect M1 × 6

Question			Answer	Marks	AO element	Guidance
		(ii)	The smaller pieces have a larger mass. ☐ The smaller pieces have a larger surface area. ☒ The smaller pieces have a larger volume. ☐ ✓	1	3.1b	
	(e)		Rate of reaction = $1.5\text{ cm}^3/\text{s}$ ☐ Rate of reaction > $1.5\text{ cm}^3/\text{s}$ ☒ Rate of reaction < $1.5\text{ cm}^3/\text{s}$ ☐ ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	Sensible scale on y-axis ✓ All 4 points plotted correctly scores 2 marks BUT 2 or 3 points plotted correctly scores 1 mark ✓ ✓	3	3 × 2.2	Check scale is linear ALLOW ±½ square Alternative scale could be one square = 90: 450, 900, 1350, 1800, 2250, 2700, 3150, 3600
		(ii)	Straight line of best fit ✓	1	1.2	ALLOW ECF from incorrect scale or plotting in a(i)
		(iii)	2200 (kJ/mol) ✓	1	3.2b	ALLOW answer taken from line of best fit in (a)(ii) ALLOW ±½ square If alternative scale was used, intersection should be at 24 squares = 2160
	(b)	(i)	(Carbon monoxide / CO is) toxic ✓ (Carbon dioxide / CO ₂ causes) global warming ✓	2	2 × 1.1	ALLOW correct description of action of carbon monoxide on haemoglobin/red blood cells IGNORE harmful / dangerous / respiratory problems ALLOW description of effects of global warming / carbon dioxide is a greenhouse gas / enhances greenhouse effect / increases rate of climate change DO NOT ALLOW methane is a greenhouse gas / effects of methane
		(ii)	(Idea that carbon monoxide is produced by) incomplete combustion (of methane) ✓ Idea that there is a limited amount of oxygen ✓	2	2 × 3.2b	ALLOW air for oxygen

Question			Answer	Marks	AO element	Guidance
13	(a)		The alkali metals ☐ The halogens ☒ The noble gases ☐ ✓	1	1.1	
	(b)		It has 7 electrons in its outer energy level/shell ✓	1	2.1	ALLOW 7 outer electrons ALLOW 2.8.7 IGNORE 2.7 IGNORE it needs one more electron to have a full shell
	(c)	(i)	Sodium chloride ✓	1	2.1	DO NOT ALLOW Sodium chlorine IGNORE NaCl/ or salt
		(ii)	Put a lid / cover on the gas jar ✓	1	3.3b	ALLOW do the experiment in a fume cupboard ALLOW use a bung / suitable non-flammable item to cover gas jar IGNORE well-ventilated area / gas extractor / gas masks / (safety) goggles / do it outside
		(iii)	Any one from: Idea that (the alloy is) unreactive/doesn't react with the sodium ✓ Idea that (the alloy has a) high melting point/won't melt ✓	1	3.1b	IGNORE use of copper for the alloy
	(d)	(i)	Decreases / gets less (down the group) / ORA ✓	1	1.1	
		(ii)	Z ✓	1	3.1a	

		(iii)	<table><tr><th>The reactivity of the Group 7 elements increases as...</th><th>True</th><th>False</th></tr><tr><td>...their atoms have more electron shells.</td><td></td><td>✓</td></tr><tr><td>...their atoms gain electrons more easily.</td><td>✓</td><td></td></tr><tr><td>...the number of protons in the nucleus increases.</td><td></td><td>✓</td></tr></table> ✓✓	The reactivity of the Group 7 elements increases as...	True	False	...their atoms have more electron shells.		✓	...their atoms gain electrons more easily.	✓		...the number of protons in the nucleus increases.		✓	2	2 × 1.1	All three correct = 2 marks Any one/two correct = 1 mark
The reactivity of the Group 7 elements increases as...	True	False																
...their atoms have more electron shells.		✓																
...their atoms gain electrons more easily.	✓																	
...the number of protons in the nucleus increases.		✓																
	(e)	(i)	(Stage) 4 ✓	1	3.2a													
		(ii)	To kill bacteria ✓	1	1.2	ALLOW sterilise water ALLOW kill / destroy microorganisms / pathogens IGNORE get rid of / prevent / remove bacteria IGNORE clean / cleanse / sanitise / purify / make it potable / make it drinkable												

Question	Answer	Marks	AO element	Guidance
14*	Level 3 (5–6 marks) Detailed description and use of Le Chatelier's Principle States Le Chatelier's Principle and describes and explains a change in a reaction condition that produces as much hydrogen as possible. <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 and use of Le Chatelier's Principle States Le Chatelier's Principle and describes a change in a reaction condition that produces as much hydrogen as possible. Or Describes and explains how changing a reaction condition produces as much hydrogen as possible. <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 description and use of Le Chatelier's Principle Attempts to state Le Chatelier's Principle Or Attempts to describe a change in a reaction condition that produces as much hydrogen as possible. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i>	6	2 × 1.1 4 × 2.1	AO1.1 Demonstrate knowledge and understanding of scientific ideas i.e. States Le Chatelier's principle e.g. - the idea that when a change is made to a reaction at equilibrium the position of equilibrium moves to oppose the change - the idea that when reaction conditions change, an equilibrium mixture of chemicals responds in a way that tends to counteract the change AO2.1 Apply knowledge and understanding of scientific ideas i.e. Uses Le Chatelier's principle to describe and explain a change in a reaction condition to produce as much hydrogen as possible e.g. - increase temperature/use a higher temperature - equilibrium moves to the right/favour the products - to cool the reaction down - as the forward reaction is endothermic/as the backwards reaction is exothermic - decrease pressure/use a lower pressure - equilibrium moves to the right/favour the products - to increase the pressure - as more moles of CO and H₂/products/less moles of CH₄ and H₂O/reactants

Question			Answer	Marks	AO element	Guidance
			0 marks <i>No response or no response worthy of credit.</i>			• increase concentration of CH₄/H₂O/reactants • equilibrium moves to the right/favour the products • to remove CH₄/H₂O/reactants • decrease concentration of CO/H₂/products • equilibrium moves to the right/favour the products • to make more CO/H₂/products

Question			Answer	Marks	AO element	Guidance
15	(a)		First check the answer on the answer line If answer = 0.18 (MJ) award 4 marks $(100 - 96\% =) 4\% \checkmark$ $4\% \text{ of } 300 \text{ (MJ)} = 12 \text{ (MJ)} \checkmark$ $15 \text{ (g)} = 0.015 \text{ (kg)} \checkmark$ $12 \times 0.015 = 0.18 \text{ (MJ)} \checkmark$ Alternative Method: $15 \text{ (g)} = 0.015 \text{ (kg)} \checkmark$ $0.015 \times 300 \text{ (MJ)} = 4.5 \text{ (MJ)} \checkmark$ $4.5 \text{ (MJ)} \times 96\% = 4.32 \text{ (MJ)} \checkmark$ $4.5 - 4.32 = 0.18 \text{ (MJ)} \checkmark$	4	4×2.2	ALLOW ECF throughout 96% of 300 = 288 and $300 - 288 = 12$ scores M1 and M2 or $4.5 \times 4\% = 0.18 \text{ (MJ)}$ scores M3 and M4

	(b)	(i)	Any one from: <u>Positive factors</u> Idea that it encourages recycling ✓ Reduces waste going to landfill ✓ Separate bin for different types of waste ✓ And any one from: <u>Negative factors</u> The cans may need to be sorted (as not all are aluminium) / the bin for cans doesn't state just aluminium cans ✓ Ideas related to transportation of recycled materials to recycling plant ✓ Idea that people may put items in the wrong bin ✓	2	2 × 3.1b	IGNORE idea of cost / less energy used for recycling / saving finite resources ALLOW any valid ideas linked to the positive role of the bins in supporting recycling e.g. materials are sorted (to make recycling more efficient) / children learn to recycle ALLOW any valid ideas linked to the negative role of the bins e.g. more bins need emptying / some products have mixed materials so people unsure which bin to use / errors can contaminate waste
		(ii)	Any one from: Cleaned / washed ✓ Crushed / compressed ✓ Shredded ✓ And any one from: Melted ✓ (Re)moulded / (re)shaped ✓	2	2 × 1.2	IGNORE sorted

Question			Answer	Marks	AO element	Guidance
16	(a)		Idea that some of the infrared radiation is absorbed / trapped by the greenhouse gases ✓ Idea that some of the infrared radiation is re-emitted / re-radiated back to the Earth's surface ✓	2	2 × 1.1	ALLOW IR / radiation / energy / heat / for infrared ALLOW named greenhouse gases such as carbon dioxide etc. DO NOT ALLOW idea that IR is absorbed by the atmosphere IGNORE greenhouse gases are trapped in atmosphere IGNORE idea that sun's light / light rays are absorbed / trapped NOTE: mention of ozone is a CON – limit to max 1 mark
	(b)		Idea that the Earth's temperature has increased as the concentration of methane has increased ✓ And any one from: Idea that Earth's temperature goes up and down / fluctuates (but methane levels are constantly rising) ✓ Idea that there may be other named factors that are causing the Earth's temperature to increase ✓ Idea that Earth's atmosphere is complex so hard to draw accurate conclusions ✓	2	2 × 3.1b	Named factors causing Earth's temperature to increase include increased CO₂ levels / other greenhouse gases / things that cause an increase in CO₂ levels e.g. burning fossil fuels

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