Smart Edge!
More Than Knowledge

OCR · GCSE COMBINED SCIENCE A (GATEWAY) J250

Chemistry — Higher Tier, Paper 1

June 2025 exam series

MARK SCHEME

Higher

GCSE

Combined Science Chemistry A Gateway Science

J250/09: Paper 9 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2025

Oxford Cambridge and RSA Examinations

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.

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 posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **number of required** 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 40% 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 and mark any responses using the annotations in section 11.

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 is not 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.**

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 **13**.

Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

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

10. **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.

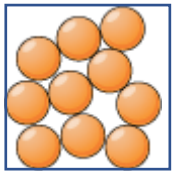
Question	Answer	Marks	AO element	Guidance
1	C	1	1.1	
2	B	1	1.1	
3	C	1	1.1	
4	B	1	2.2	
5	A	1	1.1	
6	D	1	1.1	
7	B	1	2.2	
8	B	1	2.1	
9	D	1	1.1	
10	B	1	2.2	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	Any value from 1 to 6 ✓	1	1.1	**ALLOW** below 7 **AW** **ALLOW** zero
		(ii)	Universal (indicator) ✓ Red ✓	2	2 × 1.1	 **ALLOW** pink / yellow / orange
		(iii)	pH meter / pH probe ✓	1	3.3b	
	(b)		Magnesium sulfate ✓	1	2.1	**ALLOW** correct formula
	(c)		Magnesium carbonate/white powder/solid disappears ✓ Fizzing/bubbling/effervescence ✓	2	2 × 2.2	**IGNORE** dissolves **IGNORE** gas produced
	(d)		Step 1: Filtration ✓ Step 2: Crystallisation / Evaporation ✓	2	2 × 1.2	 **ALLOW** distillation **DO NOT ALLOW** fractional distillation
	(e)	(i)	As (the mass of) magnesium carbonate increases (up to 5.0g)(the mass of) the salt increases ✓ Idea that the mass of magnesium carbonate increases from 5.0 g (to 7.0 g) the mass of the salt stays the same / at 7.1 g ✓	2	2 × 3.1a	**ALLOW** they both go up **ALLOW** directly proportional **ALLOW** 6.0g instead of 5.0g as the data used to describe the trend **ALLOW** towards the end no more salt is produced / **AW** (if no data is given)
		(ii)	No more product is formed ✓	1	3.1b	

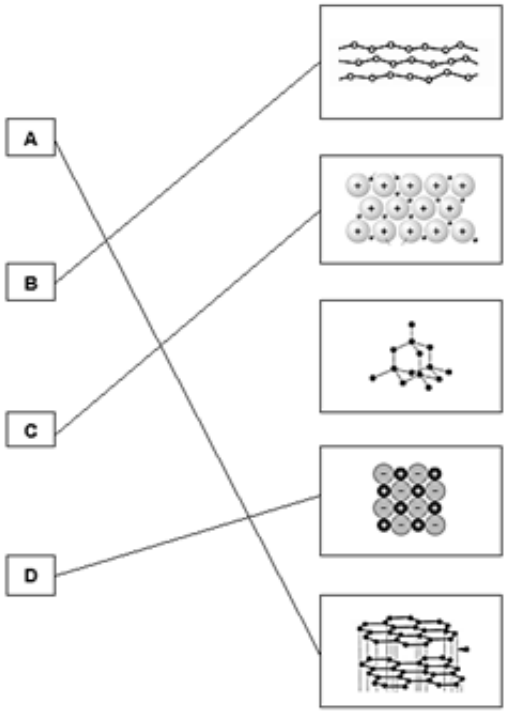
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>12</td><td>(a)</td><td></td><td>
<table>
<tr><th>Sub-Atomic particle</th><th>Relative mass</th><th>Relative charge</th></tr>
<tr><td>Electron</td><td>0.005</td><td>-1</td></tr>
<tr><td>Neutron</td><td>1</td><td>0</td></tr>
<tr><td>Proton</td><td>1</td><td>+1</td></tr>
</table>
✓✓
</td><td>2</td><td>2 × 1.1</td><td>All three correct = 2 marks
Any one correct = 1 mark</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Number of protons and number of electrons = 15 ✓

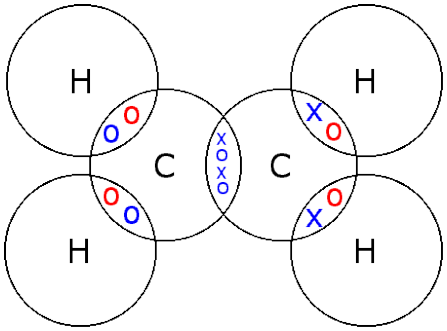
Number of neutrons = 16 ✓</td><td>2</td><td>2 × 2.1</td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>PO ☐
P_2O_3 ✓
P_4O_6 ☐
✓</td><td>1</td><td>2.1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>$6H_2O$ ✓

$4H_3PO_3$ ✓</td><td>2</td><td>2 × 2.2</td><td>ALLOW any correct correct multiples
e.g., $2P_4O_6 + 12H_2O \rightarrow 8H_3PO_3$</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
		(iii)	Clearly drawn particle diagram of a liquid e.g.  ✓	1	2.1	**ALLOW** an irregular pattern **ALLOW** majority of particles touching **ALLOW** a box that is not full **DO NOT ALLOW** gaps larger than the size of the particles drawn

Question			Answer	Marks	AO element	Guidance
13*			**Level 3 (5–6 marks)** **Detailed description of their choice of reaction** States the reaction is exothermic and gives accurately analysed information from all the boxes to explain their choice. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** **Clear description of their choice of reaction** States the reaction is exothermic and gives a clear explanation of the information from some of boxes to explain their choice. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** **Basic description of their choice of reaction** States the reaction is exothermic and gives a limited overview/piece of information to explain their choice. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant***.** **0 marks** *No response or no response worthy of credit.*	**6**	**4 × 1.1** **2 × 3.2b**	**AO1.1 Demonstrate knowledge and understanding of scientific ideas e.g.,** Information from box 1: • releases/gives out energy • transfers energy to the surroundings • surroundings heat up • reaction feels hot Information from box 2: • temperature increases • temperature change is positive • temperature change is +22 °C Information from box 3: • products have less energy than reactants • energy change is negative **AO3.2b Analyse information and ideas to draw conclusions** Identifies reaction as exothermic

Question			Answer	Marks	AO element	Guidance
14	(a)		 ✓✓✓✓	4	4 × 3.2b	One mark for each correct line

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	 Four electrons between the two carbons ✓ Two electrons between each of the four carbon and hydrogens ✓	2	2 × 1.2	**ALLOW** any combination of 'dots' and 'crosses' to represent the electrons **ALLOW** electrons as all dots, all crosses, or a mix of dots and crosses **ALLOW** diagrams with inner electron shells, but inner shells must be correct if shown **MAX** 1 mark if extra electrons are drawn outside the overlap regions of the diagram
		(ii)	Exists as simple (covalent) molecules ✓ Idea of weak forces between molecules / weak intermolecular forces / forces between molecules require little energy to break ✓	2	2 × 1.1	**ALLOW** exists as small molecules **DO NOT ALLOW** intermolecular bonds / breaking bonds **DO NOT ALLOW** any reference to electrostatic attractions / delocalised electrons

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	**First check the answer on the answer line** **If answer = 2825 (kJ/mol) award 1 mark** C-C + 6(C-H) = 347 + 6(413) = 2825 ✓	1	2.2	
		(ii)	**First check the answer on the answer line** **If answer = 2700 (kJ/mol) award 1 mark** C=C + 4(C-H) + H-H = 612 + 4(413) + 436 = 2700 ✓	1	2.2	
		(iii)	**First check the answer on the answer line** **If answer = (+)125 (kJ/mol) award 1 mark** 2825 – 2700 = (+)125 ✓	1	2.2	**ECF** from parts **(i)** and **(ii)** but check the sign is consistent with their values **DO NOT ALLOW -**125 as this is an incorrect calculation (unless valid from **ECF**)

Question			Answer	Marks	AO element	Guidance
15	(a)		They contain hydroxide ions / OH^- ions ✓	1	1.1	**ALLOW** they are soluble bases **ALLOW** pH is above 7
	(b)		Hydroxide ions are OH^- / have a -1 charge ✓ Therefore, sodium ions are Na^+ / have a +1 charge and calcium ions are Ca^{2+} / have a +2 ✓ As the idea that the positive and negative charges in the compounds cancel out ✓	3	1.1 2 × 2.1	
	(c)		**Any two from:** The solution contains hydrogen ions / H^+ ions ✓ H^+ ions are attracted to the cathode / negative electrode ✓ H^+ ions are discharged / reduced / gain electrons ✓ **And:** Hydrogen is less reactive than sodium / **ORA** ✓	3	3 × 2.2	**ALLOW** $2H^+ + 2e^- \rightarrow H_2$ for 2 marks **ALLOW** hydrogen forms cations 'Hydrogen is produced at the cathode' is in the stem of the question so must clearly refer to the **attraction**
	(d)	(i)	$CaCO_3$ / calcium carbonate ✓	1	3.2b	
		(ii)	Limewater ✓	1	3.2b	

Question			Answer	Marks	AO element	Guidance
		(iii)	**First check the answer on the answer line** **If answer = 0.023 (g) award 4 marks** M_r $Ca(OH)_2$ = 74.1 and CO_2 = 44.0 ✓ moles $Ca(OH)_2$ (= 0.038 ÷ 74.1) = 0.000513 ✓ mass CO_2 = (0.000513 × 44.0) = 0.0226 ✓ **2 significant figures:** = 0.023 ✓	**4**	**3 × 2.2** **1.2**	If the final answer is quoted as 0.022 then award 3 marks unless there are obvious errors in the processing. This is due to early rounding in the calculation when 0.0005 or 0.00051 are used instead of 0.000513 **ALLOW ECF** from incorrect M_r of $Ca(OH)_2$ **ALLOW ECF** from incorrect moles of $Ca(OH)_2$ and/or M_r of CO_2 **ALLOW** clear evidence of correct conversion of incorrect answer to 2 significant figures

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