OCR
Oxford Cambridge and RSA

Higher

GCSE

Combined Science Chemistry A Gateway Science

J250/09: Paper 9 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

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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 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. Award No Response (NR) if:

    - there is nothing written in the answer space

    Award Zero '0' if:
    - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

    Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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 **13**.

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

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

12. **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) 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	C	1	2.1	
3	C	1	2.1	
4	A	1	1.2	
5	D	1	1.1	
6	B	1	1.2	
7	A	1	1.1	
8	B	1	1.1	
9	A	1	2.1	
10	B	1	2.1	

Question			Answer	Marks	AO element	Guidance
11	(a)		Idea that lithium is on the left (of the Periodic Table) / metals are on the left **and** oxygen is on the right (of the Periodic Table) / non-metals are on the right ✓ **Or** Lithium is in Group 1 (which are metals) **and** oxygen is in Group 6 (which are non-metals) ✓	**1**	**1.1**	**IGNORE** lithium forms positive ions and oxygen forms negative ions **ALLOW** oxygen is in group 16 instead of group 6
	(b)		**4**Li + O_2 → **2**Li_2O 4(Li) ✓ 2(Li_2O) ✓	**2**	 **1.1** **2.2**	**ALLOW** any correct multiples
	(c)		2, 1 ✓	**1**	**2.1**	**ALLOW** diagram **ALLOW** sentences describing the electron arrangement
	(d)		It loses (electrons) ✓ (It loses) 1 / an electron ✓	**2**	**2 x 2.1**	**DO NOT ALLOW** shares for this marking point (CON) **ALLOW** the idea that lithium 'gives **its** electron to oxygen' for 2 marks
	(e)		Idea that both are in Group 1 / both are in the same group / both have 1 electron in their outer energy level / both lose 1 electron / both form 1+ ions ✓	**1**	**3.1b**	
	(f)		Atoms with the same atomic number ✓ but different mass numbers ✓ **Or** Atoms with the same number of protons ✓ but different numbers of neutrons ✓	**2**	**2 x 1.1**	**ALLOW** answers based upon lithium e.g., both isotopes have 3 protons but ^{6}Li has 3 neutrons and ^{7}Li has 4 neutrons **ALLOW** atoms of the same element as **AW** to same atomic number **IGNORE** electrons

	(g)	**(i)**	**First check answer on the answer line** **If answer = 28.57 / 28.6 / 29 (%) award 2 marks** 4 ÷ 14 (x 100) ✓ = 28.57 / 28.6 / 29 (%) ✓	**2**	**2 x 2.2**	**ALLOW** any correct rounding of calculator answer of 28.571428
		(ii)	Idea that the diagram contains too many atoms of lithium / too few aluminium atoms ✓	**1**	**3.1b**	**ECF** from an incorrectly calculated percentage relating to the diagram e.g. value is below 2% lithium **INGORE** any reference to percentage values

Question			Answer	Marks	AO element	Guidance
12	(a)		**Any 3 from:** Ions in a solid <u>vibrate</u> in a fixed position ✓ Ions gain energy / vibrate or move more / vibrate or move faster ✓ (Ionic) bonds become weaker ✓ (Ionic) bonds break / lattice breaks down / ions are now irregularly arranged ✓ Ions start to move freely or randomly (past each other) ✓	3	3 x 1.1	**ALLOW** particles instead of ions If molecules / atoms are used instead of ions maximum of 2 marks **IGNORE** intermolecular forces
	(b)		So the <u>ions</u> are free to move / **AW** ✓	1	1.2	**DO NOT ALLOW** delocalised electrons
	(c)		Potassium / K ✓ $K^+ + e^- \rightarrow K$ ✓	2	2 x 1.2	**DO NOT ALLOW** ions **ALLOW** half equation given here if product is K
	(d)		Hydrogen / H_2 ✓ Potassium is more reactive than hydrogen / **ORA** ✓	2	2 x 3.1b	**DO NOT ALLOW** ions **ALLOW** half equation given here if product is H_2

Question			Answer	Marks	AO element	Guidance
NB. If no observations are given then maximum level 2 awarded. If only one experiment discussed, then also maximum level 2.						
13*			**Level 3 (5–6 marks)** Clear description of both experiments, both sets of observations and analysis of results to determine correct labelling. *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 both experiments with some observations and analysis of results to determine some of the correct labelling. *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 an experiment and a linked observation or relevant conclusion. *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 x 2.1** **2 x 3.3a**	**IGNORE** repeats of the stem of the question regarding solubility in water and reaction with acid. **IGNORE** any and all subsequent experiments to identify or collect the gas, e.g. using limewater or the use of indicators **AO2.1 Apply knowledge and understanding of scientific ideas e.g.,** Describes experiments and observations • **Add solid to water** and determine solubility • If the solid **dissolves/disappears** it is soluble • If the solid **does not dissolve/disappear** it is insoluble • **Add solid to dilute hydrochloric acid** and determine if a reaction has taken place • Carbonates **fizz** when added to acid • Sodium chloride **does not fizz** when added to acid **AO3.3a Analyse information and ideas to develop experimental procedures e.g.,** Analysing experimental data • Concludes that calcium carbonate does not dissolve so must be A • Concludes that sodium chloride does not fizz in acid so must be C • Concludes that sodium carbonate dissolves in water and fizzes in acid so must be B

Question			Answer	Marks	AO element	Guidance
14	(a)		Formula: H_2O drawn or written ✓ Balancing: **4** H_2O drawn or written ✓	**2**	**2 x 2.1**	**If no other marks are awarded** **ALLOW** $4xH^+$ **and** $4xOH^-$ drawn in the box for 1 mark
	(b)		Calcium chloride ✓ $CaCl_2$ ✓	**2**	**1.2** **2.1**	
	(c)		Neutralisation ✓	**1**	**3.2b**	
	(d)		**P** ☐ ✓ **Q** ☐ **S** ☐ ✓ Contains hydrogen ions / H^+ ✓ Is fully ionised ✓	**3**	**2 x 3.2b**	**IGNORE** named ions in MP3 **ALLOW** almost completely ionised / **AW**
	(e)		**First check the answer on the answer line** **If answer = 8 (g / dm^3) award 3 marks** 250 ÷ 1000 = 0.250 (dm^3) ✓ 2 ÷ 0.250 ✓ = 8 (g / dm^3) ✓	**3**	**3 x 2.1**	**ALLOW ECF** for incorrect or missing conversions e.g. 8 x 10^{-3} / 0.08 / 0.8 for 2 marks

			Or 2 ÷ 250 = 0.008 (g / cm^3) ✓ 0.008 x 1000 ✓ = 8 (g / dm^3) ✓			

Question			Answer	Marks	AO element	Guidance
15	(a)		Idea that the amount of product is determined by the amount of the limiting reactant / **AW** ✓	1	1.2	**ALLOW** idea of a negative impact on the yield e.g. reduces yield
	(b)		**Moles of copper oxide:** 2.00 ÷ 79.5 = 0.025172 ✓ **Moles of carbon:** 1.00 ÷ 12.0 = 0.083333✓ Both answers must be quoted to 3 decimal places 0.025 and 0.083 ✓	3	3 x 2.2	
	(c)		Idea that the moles of copper oxide are less than the moles of carbon / **ORA** ✓	1	3.1b	
	(d)		**First check the answer on the answer line** **If answer = 2.9 (g) award 3 marks** Mass of Cu = 0.045 x 63.5 ✓ = 2.8575 ✓ = 2.9 (g) to 2 significant figures ✓	3	2 x 2.2 1.2	**ALLOW ECF** common examples include moles of Cu multiplied by 2 (5.7g) or the use CuO Mr instead of Cu (3.6g) **ALLOW ECF** for sig fig mark from a valid calculation

Question			Answer	Marks	AO element	Guidance
16	(a)		**Any 2 observations from:** **Observations** Idea that most particles went (straight) through ✓ Idea that some particles were deflected / changed direction ✓ Idea that some particles were reflected / repelled / bounced back ✓ **Any 1 conclusion from:** **Conclusions**: The atom is mainly empty space ✓ The (nucleus) centre of the atom is positively charged ✓ Most of the mass of the atom is at the centre (in the nucleus) ✓	**3**	**3 x 1.1**	**IGNORE** refracted for MP2 and MP3
	(b)		Idea that electrons occupy energy levels / shells ✓	**1**	**1.1**	
	(c)		1 x 10^{-10} – 9 x 10^{-10} (m) ✓	**1**	**1.1**	**ALLOW** 10^{-10}

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