

Foundation

GCSE

Chemistry A (Gateway Science)

J248/02: Paper 2 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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 a tick 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 **Q22(c)**

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 Chemistry:

	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.

Question			Answer	Marks	AO element	Guidance
1			C ✓	1	1.1	
2			C ✓	1	1.2	
3			A ✓	1	1.1	
4			D ✓	1	1.2	
5			D ✓	1	1.1	
6			D ✓	1	1.1	
7			A ✓	1	1.1	
8			C ✓	1	1.1	
9			C ✓	1	2.2	
10			C ✓	1	2.2	
11			A ✓	1	2.1	
12			A ✓	1	2.1	
13			A ✓	1	1.2	
14			C ✓	1	2.2	
15			B ✓	1	2.2	

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
16	(a)		A ✓ C ✓ E ✓	3	2.1	2 correct ticks = 2 marks 1 correct tick = 1 mark
	(b)		Alkenes ✓	1	2.1	
	(c)		Carbon dioxide ✓ Water ✓	2	1.1	ALLOW CO ₂ , but NOT CO ₂ / CO ² ALLOW H ₂ O but NOT H ₂ O / H ² O Answers can be in either order
	(d)		Crude oil is <u>heated</u> as it enters a fractionating column ✓ The vapours get <u>colder</u> as they rise. ✓ The vapours <u>condense</u> to a liquid at different points. ✓ The separated parts of crude oil are called <u>fractions</u> . ✓	4	1.1	
	(e)		Idea that a finite resource is no longer being made or is being made extremely slowly ✓	1	1.1	ALLOW fixed amount / will run out/ limited supply / non-renewable

Question			Answer	Marks	AO element	Guidance																				
		(ii)	<p>Any <u>two advantages</u> and any <u>two disadvantages</u> from:</p> <p>LABORATORY</p> <table><tr><th>ADVANTAGES</th><th>DISADVANTAGES</th></tr><tr><td>Atom economy is 100% ✓</td><td>Batch ✓</td></tr><tr><td>Titration – 1 stage ✓</td><td>Slow ✓</td></tr><tr><td></td><td>Small scale ✓</td></tr></table> <p>INDUSTRY</p> <table><tr><th>ADVANTAGES</th><th>DISADVANTAGES</th></tr><tr><td>Atom economy is 100% ✓</td><td>Idea that H₂SO₄ and NH₃ made from raw materials – multi stage ✓</td></tr><tr><td>Continuous ✓</td><td></td></tr><tr><td>Large scale ✓</td><td></td></tr><tr><td>Quick ✓</td><td></td></tr><tr><td>Can make (NH₄)₂SO₄ from by-products of other processes ✓</td><td></td></tr></table>	ADVANTAGES	DISADVANTAGES	Atom economy is 100% ✓	Batch ✓	Titration – 1 stage ✓	Slow ✓		Small scale ✓	ADVANTAGES	DISADVANTAGES	Atom economy is 100% ✓	Idea that H ₂ SO ₄ and NH ₃ made from raw materials – multi stage ✓	Continuous ✓		Large scale ✓		Quick ✓		Can make (NH ₄) ₂ SO ₄ from by-products of other processes ✓		4	3.1b	<p>Mark the first two advantages and the first two disadvantages</p> <p>It must be clear which is an advantage and which a disadvantage, though look out for inferred judgements, and inferred change from one to the other eg ‘whereas’</p>
ADVANTAGES	DISADVANTAGES																									
Atom economy is 100% ✓	Batch ✓																									
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Question			Answer	Marks	AO element	Guidance
18	(a)		<p>To work out the potential amount of fuel used by the car. ☐</p> <p>To work out the potential cost of each stage of the life of the car. ☐</p> <p>To work out the potential environmental impact at each stage of the life of the car. ☒</p> <p>To work out the potential health & safety issues at each stage of the life of the car. ☐</p> <p style="text-align: right;">✓</p>	1	1.1	
	(b)	(i)	<p>Petrol car ☒ ✓</p> <p>Diesel car ☐</p> <p>Electric car ☐</p>	1	3.1a	
		(ii)	<p>Petrol car ☐</p> <p>Diesel car ☐</p> <p>Electric car ☒ ✓</p>	1	3.1a	

Question			Answer	Marks	AO element	Guidance
	(c)		Any two from: Melting ice caps ✓ Rising sea levels ✓ Oceans become more acidic ✓	2	1.1	ALLOW one umbrella term eg altered weather / climate change / global warming/ temperature of earth to rise ALLOW a consequence of climate change e.g. flooding / drought / ALLOW a consequence of more acidic oceans
	(d)		Idea that electricity can be generated from renewable sources e.g. wind / wave / hydro-electric / solar ✓	1	3.2a	ALLOW 'renewable sources' ALLOW biomass / wood burning ALLOW oil/ gas/ nuclear arguments

Question			Answer	Marks	AO element	Guidance
19	(a)		(Aluminium) has low(est) density ✓ (Aluminium) will not corrode ✓	2	3.1b	
	(b)		Metal – copper ✓ (Explanation) Any two from: Excellent conductor of electricity ✓ Only corrodes slowly ✓ Idea that the metal will not melt [if cable gets hot during charging] ✓	3	3.2b 2.1 x 2	
	(c)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.25 or 0.25:1 or 1:4 award 2 marks Ratio = $165 \div 660$ ✓ =0.25 or 0.25:1 or 1:4 ✓	2	1.2	ALLOW any simplified ratio consistent with 0.25:1 for 2 marks eg 3:12 or 11:44 ALLOW 1 mark for correct ratio wrong way round e.g. 1:0.25 or 4:1
	(d)		Any two from: (Poly(chloroethene)) does not corrode ✓ (Poly(chloroethene)) has a lower density / lighter ✓ (Poly(chloroethene)) is more flexible ✓	2	2.1	ALLOW answers in terms of disadvantages of iron
	(e)	(i)	Idea that chloroethene does not contain carbon and hydrogen <u>only</u> / Chloroethene contains chlorine ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
		(ii)	$\left[\begin{array}{cc} \text{H} & \text{Cl} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n$ <p>Correct displayed formula ✓ Use of brackets and 'n' ✓</p>	2	2.1	<p>ALLOW square or round brackets</p> <p>ALLOW 'n' in front of the brackets</p> <p>Second mark is dependent on first</p>

Question			Answer	Marks	AO element	Guidance
20	(a)		(Carbon monoxide) is poisonous / toxic ✓ AND any one from: (Carbon monoxide) can cause difficulty breathing or suffocation ✓ attaches to the haemoglobin (protein) in red blood cells ✓ reduces the amount of oxygen that the blood can carry ✓ can cause drowsiness ✓	2	1.1	IGNORE harmful / dangerous / deadly ALLOW Reference to inhalation
	(b)		Any one from: [Erosion of] stonework ✓ [corrosion of] metals ✓ kills trees or kills [living things in] rivers / lakes ✓ breathing difficulties ✓	1	1.1	IGNORE 'rotting' of stonework / metals Destroys crops / plants die "destroys/damages ecosystems" "ruins habitats" not quite specific enough
	(c)	(i)	25 (%) ✓	1	2.1	
		(ii)	Factories and industry ✓	1	2.1	
	(d)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 3.0 / 3 (tonnes) award 3 marks M_r of NO = 30.0 OR N_2 = 28.0 ✓ Mass of NO = $\frac{60.0}{28.0} \times 1.4$ ✓ = 3.0 (tonnes) ✓	3	2.2	ALLOW ECF from incorrect M_r values

Question	Answer	Marks	AO element	Guidance

Question	Answer	Marks	AO element	Guidance
21*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Applies knowledge and understanding to identify the elements in relation to their position the Periodic Table AND Describes their properties and reactivity of all three elements. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Applies knowledge and understanding to identify the elements in relation to their position the Periodic Table AND Attempts to describe their properties or reactivity. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Applies knowledge and understanding to identify the elements in relation to their position the Periodic Table OR Attempts to describe their properties and reactivity. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>	6	3 x 1.1 3 x 2.1	<p>AO2.1 Apply knowledge and understanding of scientific ideas Identifies the elements in relation to their position in the Periodic Table and uses this to explain their properties and reactivity:</p> <ul style="list-style-type: none"> • X is a Group 1 metal / X is sodium • Group 1 elements have 1 electron in the outer shell, which is easily lost (to get a full outer shell) • Y is a transition metal / Y is silver • Z is a Group 7 element or non-metal / Z is chlorine • Links metallic structure to properties • Group 7 elements have 7 electrons in their outer shell and gain 1 electron to get a full outer shell <p>AO1.1 Demonstrate knowledge and understanding of scientific ideas <u>Element X</u></p> <ul style="list-style-type: none"> • Very reactive (with oxygen/air and water) • Reacts with Group 7 elements • Metal • Shiny when freshly cut • Soft • Low density / floats on water <p><u>Element Y</u></p>

Question			Answer	Marks	AO element	Guidance
						<ul style="list-style-type: none"> • Shiny when freshly cut • Good conductor of electricity • Strong • Malleable • Higher density (than X) • Less reactive (than X) <p><u>Element Z</u></p> <ul style="list-style-type: none"> • Very reactive • Reacts with Group 1 elements • Gas • Low melting point / boiling point

Question			Answer	Marks	AO element	Guidance
22	(a)		$2\text{H}_2\text{O}_2 \rightarrow \text{O}_2 + 2\text{H}_2\text{O}$ Formulae ✓ Balancing ✓	2	2.2	ALLOW any correct multiple, including fractions DO NOT ALLOW and / & instead of '+' balancing mark is dependent on the correct formulae but ALLOW 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. $2\text{H}_2\text{O}_2 \rightarrow \text{O}_2 + 2\text{H}_2\text{O}$ IGNORE state symbols
	(b)		All points plotted correctly ✓ Line of best fit drawn ✓	2	2.2 1.2	ALLOW $\pm\frac{1}{2}$ square LOBF should omit the point at (20,16.5) ALLOW ECF from plotting for LOBF
	(c)		Any two from: Idea that line for catalyst B is steeper ✓ Idea that more gas is produced in a certain time / idea that the reaction finishes in a shorter time ✓ Idea that catalyst B speeds up the reaction <u>more</u> (than catalyst A) ✓	2	3.2b	ALLOW the reaction with catalyst B is <u>faster</u>
	(d)		Same volume or 50 cm ³ of hydrogen peroxide in each experiment ✓	1	2.2	ALLOW same amount of hydrogen peroxide in each experiment ALLOW idea that catalysts only affect the rate (but don't change the amount of product made)
	(e)		18.0 (cm ³) ✓	1	2.2	ALLOW 18 (cm ³)

Question			Answer	Marks	AO element	Guidance
	(f)		<p>Warm hydrogen peroxide to 30°C / place hydrogen peroxide in a water bath at 30°C ✓</p> <p>Measure volume of (oxygen) gas every 5 minutes ✓</p> <p>AND any one from: Compare results (to results at room temperature) ✓</p> <p>Idea that <u>gas made quicker</u> at 30°C / <u>reaction finishes quicker</u> at 30°C ✓</p>	3	3.3a	<p>ALLOW idea of doing the experiment again at 30°C</p> <p>ALLOW a different time period other than 5 minutes</p> <p>ALLOW idea of measuring the time taken to collect the gas</p> <p>ALLOW idea of placing the conical flask on a balance and recording the mass lost every eg 30s</p> <p>ALLOW idea that the time taken for hydrogen peroxide to fully decompose will be less at 30°C</p> <p>MP3 is dependent on an attempt at describing an experiment</p>

Question			Answer	Marks	AO element	Guidance												
23	(a)		Copper chloride ✓	1	3.2b	ALLOW CuCl ₂												
	(b)		Carbon dioxide ✓	1	3.2b	ALLOW CO ₂												
	(c)		Chlorine ✓	1	3.2b	ALLOW Cl ₂ but NOT Cl IGNORE chloride												
	(d)		Green-blue / turquoise / green ✓	1	1.2	ALLOW blue												
	(e)		Idea that copper is less reactive than carbon / ORA ✓	1	1.2													
	(f)		<table border="1"><thead><tr><th>Alloy</th><th>Main metals</th><th>Uses</th></tr></thead><tbody><tr><td>duralumin</td><td>copper and <u>aluminium</u></td><td>aircraft parts</td></tr><tr><td>brass</td><td>copper and <u>zinc</u></td><td>musical instruments</td></tr><tr><td>bronze</td><td>copper and tin</td><td><u>bells</u> / <u>propellers for ships</u> / <u>statues</u></td></tr></tbody></table> <div>✓✓</div>	Alloy	Main metals	Uses	duralumin	copper and <u>aluminium</u>	aircraft parts	brass	copper and <u>zinc</u>	musical instruments	bronze	copper and tin	<u>bells</u> / <u>propellers for ships</u> / <u>statues</u>	2	1.1	ALL 3 correct, 2 marks ANY 2 correct, 1 mark ALLOW any sensible use for bronze IGNORE electrical wiring/circuits for bronze IGNORE ‘parts’ for cars or ‘parts’ for ships for bronze
Alloy	Main metals	Uses																
duralumin	copper and <u>aluminium</u>	aircraft parts																
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