

Higher

GCSE

Chemistry A (Gateway Science)

J248/01: Paper 1 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2023

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.

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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 read.
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 **19(a)**.

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) in Chemistry A:

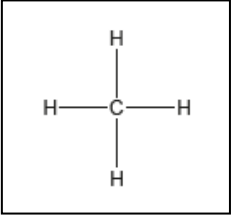
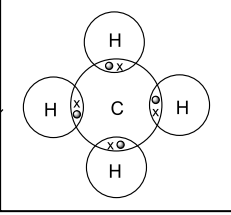
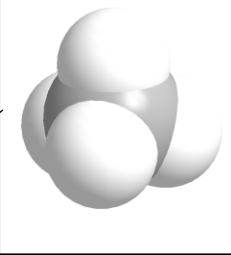
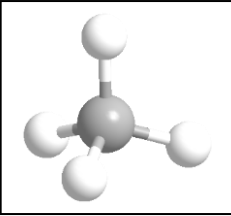
	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge 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	2.1	
3	A	1	2.2	
4	B	1	1.1	
5	C	1	2.1	
6	C	1	1.1	
7	A	1	1.2	
8	B	1	1.1	
9	A	1	1.2	
10	C	1	2.2	
11	B	1	1.1	
12	B	1	2.1	
13	D	1	1.1	
14	D	1	2.1	
15	C	1	2.2	

Question			Answer	Marks	AO element	Guidance												
16	(a)	(i)	B ✓	1	1.1													
		(ii)	Any value between -218 and -184 (°C) ✓	1	2.1													
		(iii)	A liquid becoming a solid is called freezing . ✓ In a solid, the particles move less ✓ than in a liquid. In a solid, the arrangement of particles is less ✓ random than in a liquid.	3	3 x 1.1													
	(b)		<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Particle</td> <td style="text-align: center;">Description</td> <td style="text-align: right;">✓✓</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">proton</td> <td style="border: 1px solid black; padding: 2px;">relative mass of 0.0005</td> <td></td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">electron</td> <td style="border: 1px solid black; padding: 2px;">positively charged and relative mass of 1</td> <td></td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">neutron</td> <td style="border: 1px solid black; padding: 2px;">no charge</td> <td></td> </tr> </table>	Particle	Description	✓✓	proton	relative mass of 0.0005		electron	positively charged and relative mass of 1		neutron	no charge		2	2 x 1.1	Any one correct = one mark All three correct = two marks
Particle	Description	✓✓																
proton	relative mass of 0.0005																	
electron	positively charged and relative mass of 1																	
neutron	no charge																	
	(c)	(i)	(Isotope) 3 ✓	1	2.1													
		(ii)	(Isotope) 1 ✓	1	2.1													
		(iii)	8 ✓	1	2.1													
	(d)		<p>First check the answer on answer line If answer = 0.204 (%) award 2 marks</p> <p>99.759 + 0.037 OR 99.796 ✓</p> <p>100 – 99.796 = 0.204 ✓</p>	2	2 x 2.1													

Question			Answer	Marks	AO element	Guidance
17	(a)	(i)	Idea that (a pure substance) is a single element or compound / Idea that (a pure substance) only contains one element or compound ✓	1	1.1	IGNORE has no other substance in it IGNORE is not mixed with any other substance
		(ii)	(The melting points) are sharp / idea that (the painkillers) do not melt over a range of temperatures ✓	1	2.2	ALLOW definite melting point/one melting point/set mpt / specific mpt / exact mpt IGNORE look up data
	(b)		2 ✓	1	2.2	
	(c)	(i)	First check the answer on answer line If answer = 0.69 ± 0.01 award 3 marks Rf = 5.5 (cm) / 8.0 (cm) ✓ Rf = 0.6875 ✓ significant figures Rf = 0.69 ✓	3	3 x 2.2	ALLOW distance moved by substance = 5.4 – 5.6 (cm) ALLOW ECF for significant figure mark
		(ii)	Mobile phase ✓ Stationary phase ✓	2	2 x 1.2	ALLOW paper
	(d)		Any two from: Idea that it could have more than two spots ✓ It depends on how many impurities are in the painkiller ✓ Could have one spot if R _f of impurity has same R _f as painkiller ✓	2	2 x 3.1b	ALLOW may contain many spots ALLOW may contain more than 2/many/multiple impurities / don't know how many impurities ALLOW 2 or more spots can merge into one spot

Question	Answer	Marks	AO element	Guidance
18 (a)	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ball and stick model</div> <div style="margin-left: 20px; border: 1px solid black; padding: 5px;">  </div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Dot and cross diagram</div> <div style="margin-left: 20px; border: 1px solid black; padding: 5px;">  </div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">3D Space filling model</div> <div style="margin-left: 20px; border: 1px solid black; padding: 5px;">  </div> </div> <div style="margin-bottom: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">3D Space filling model</div> <div style="margin-left: 20px; border: 1px solid black; padding: 5px;">  </div> </div> <div style="margin-top: 20px;"> <p>✓✓✓</p> </div> </div>	3	3 x 1.2	

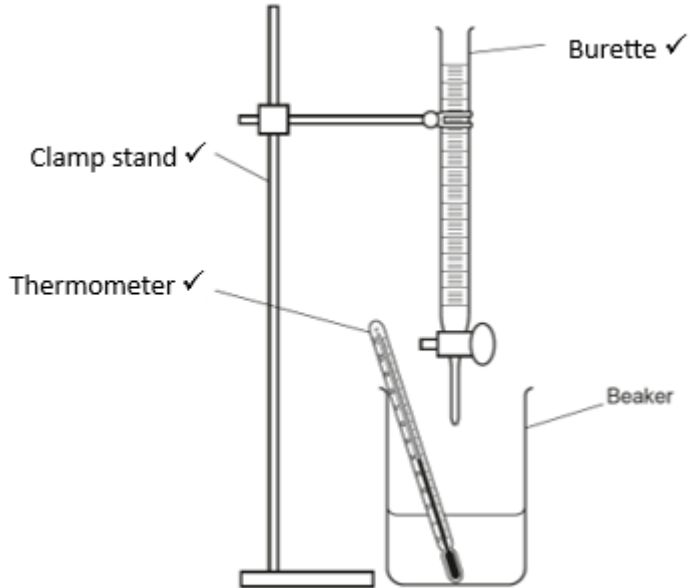
Question		Answer	Marks	AO element	Guidance
	(b)	Electrons can be seen in the bonds/shared electrons in Model 1 / ORA ✓ The lone pairs of electrons/unshared electrons can also be seen in Model 1 ✓	2	2 x 3.1b	If no marks scored ALLOW for 1 mark Model 1 shows the number of electrons(in the outer shells)
	(c) (i)	C ₄ H ₉ ✓	1	2.2	DO NOT ALLOW superscripts
	(ii)	First check the answer on answer line If answer = 114 award 3 marks (Mass of carbon =) 8 x 12 = 96 ✓ (Mass of hydrogen =) 18 x 1 = 18 ✓ 96 + 18 = 114 ✓	3	3 x 2.1	ALLOW ECF on the mass of carbon and the mass of hydrogen
	(d) (i)	1.2 (nm) ✓	1	1.2	
	(ii)	The nanotubes are only bonded by strong (covalent) bonds (which is why the nanotube is strong) ✓ Graphite has weak forces of attraction between the layers/forces between the layers are easily broken (therefore, it is not as strong) ✓	2	2 x 1.1	ALLOW all bonds are strong / all the carbon atoms are bonded together DO NOT ALLOW stronger intermolecular forces in graphene ALLOW the layers in graphite can slide IGNORE intermolecular in graphite
	(iii)	First check the answer on answer line If answer = 5 award 2 marks $1.2 \times 10^{-9} \div 2.4 \times 10^{-10}$ ✓ = 5 ✓	2	2 x 2.1	

Question		Answer	Marks	AO element	Guidance
19	(a)*	<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 detailed knowledge and understanding to describe the types of bonding and accurately links this to compare the melting points.</p> <p>AND</p> <p>Predicts that bromine has the lowest melting point <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 some knowledge and understanding to describe the types of bonding. Basic comparison made.</p> <p>AND</p> <p>Predicts that bromine has the lowest melting point <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) Attempts to apply knowledge and understanding to describe the types of bonding. Limited or no comparison made.</p> <p>OR</p> <p>Predicts that bromine has the lowest melting point.</p>	6	4 x 2.1 2 x 3.2b	<p>AO2.1 Apply knowledge and understanding of scientific ideas</p> <ul style="list-style-type: none"> • Ionic bonds / electrostatic forces in NaCl are very strong • Ionic bonds / electrostatic forces in NaCl require a lot of energy to break • Covalent bonds in diamond are very strong • Diamond has many strong covalent bonds • Covalent bonds in diamond require a lot of energy to break • Intermolecular forces in Br₂ are weak • Intermolecular forces in Br₂ require less energy to break <p>AO3.2b Analyse information to make judgements and draw conclusions</p> <ul style="list-style-type: none"> • Bromine has the lowest melting point • Sodium chloride has a higher melting point than bromine • Diamond has a higher melting point than bromine

Question		Answer	Marks	AO element	Guidance
		<p><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>			
	(b) (i)	<p>A metal alloy has different sized atoms ORA ✓</p> <p>The atoms/ions/particles of the same size can slide over each other more easily ORA ✓</p>	2	2 x 1.1	<p>ALLOW different sized particles/ions IGNORE has large/giant particles DO NOT ALLOW molecules for M1 only DO NOT ALLOW different sized elements for M1 only</p> <p>ALLOW different sized atoms/ions/particles makes it harder for layers/atoms/ions/particles to slide</p>
	(ii)	<p>Alloy 2 ✓</p> <p>Any two from:</p> <p>It is non-toxic ✓</p> <p>It has a low/medium density ✓</p> <p>It is strong ✓</p>	3	3 x 3.2a	<p>ALLOW reverse arguments for why alloys 1 and 3 are not selected</p> <p>ALLOW not too dense</p> <p>ALLOW it has high tensile strength / doesn't break easily / can support more weight</p>

Question		Answer	Marks	AO element	Guidance
20	(a)	4 → 3 → 1 → 5 ✓✓✓	3	3 x 3.3a	4 first ✓ 3 and 1 ✓ 5 last ✓
	(b)	<p>Chlorine forms negative ions. <input checked="" type="checkbox"/></p> <p>Chlorine has 3 electrons in its outer shell. <input type="checkbox"/></p> <p>Chlorine has 7 electron shells. <input type="checkbox"/></p> <p>Chlorine has 7 electrons. <input type="checkbox"/></p> <p>Chlorine is a metal. <input type="checkbox"/></p> <p>Chlorine is a non-metal. <input checked="" type="checkbox"/></p> <p>✓✓</p>	2	2 x 2.1	
	(c) (i)	12.5 ✓	1	2.2	ALLOW values between 11.0 and 14.0
	(ii)	The more copper is formed, the more oxygen is formed / ORA ✓	1	3.1a	IGNORE proportional
	(d)	Ionic ✓	1	1.2	
	(e)	<p>Make sure the electrode is dry / remove the solution from the electrode ✓</p> <p>Remove the wire/crocodile clip from the electrode ✓</p>	2	2 x 3.3b	<p>ALLOW leave to dry before weighing</p> <p>ALLOW there is water/solution on the electrode</p> <p>IGNORE excess</p> <p>ALLOW the wire/crocodile clip are on the electrode/scale/balance</p> <p>ALLOW take the mass of the wire/clip away from the mass</p> <p>ALLOW weigh only the electrode</p>

Question		Answer	Marks	AO element	Guidance
21	(a)	<p>A reaction between an acid and an alkali is neutralisation. <input checked="" type="checkbox"/></p> <p>Acids form OH⁻ ions in solution. <input type="checkbox"/></p> <p>Alkalis have a pH of less than 7. <input type="checkbox"/></p> <p>Sodium hydroxide, NaOH, is an example of an acid. <input type="checkbox"/></p> <p>✓</p>	1	1.1	
	(b) (i)	<p>First check the answer on answer line If answer = 4.35 award 3 marks</p> <p>4.37 + 4.31 + 4.38 / 13.06 ✓</p> <p>13.06 / 3 = 4.3533... ✓</p> <p>3 significant figures: = 4.35 ✓</p>	3	1.2 1.2 2.1	<p>DO NOT ALLOW 4.37 + 4.38 only</p> <p>ALLOW ECF from incorrect total mass</p> <p>ALLOW ECF for significant figure mark</p>
	(ii)	<p>H₂O (l) CO₂ (g)</p> <p>Correct formulae ✓ State symbols ✓</p>	2	2.1 1.1	<p>ALLOW H₂O (l) or CO₂ (g) for 1 mark if both formulae and state symbols not correct</p> <p>Mark for state symbol dependent on correct formulae</p>
	(iii)	Filtration ✓	1	1.2	<p>ALLOW filter DO NOT ALLOW sieving</p>
	(iv)	Crystallisation ✓	1	1.2	<p>ALLOW evaporation ALLOW heat it (so the solvent evaporates) IGNORE (simple) distillation</p>

Question			Answer	Marks	AO element	Guidance
22	(a)	(i)		3	3 x 1.2	<p>ALLOW retort stand / stand IGNORE just clamp</p>
		(ii)	<p>Any one from:</p> <p>Use a polystyrene cup (instead of a beaker) / put a lid / covering on the beaker (to keep heat in) / insulate (the outside of) the beaker ✓</p> <p>Use a digital thermometer / data logger (to measure the temperature) ✓</p>	1	3.3b	<p>IGNORE seal the beaker</p> <p>ALLOW idea of clamping or holding the thermometer in the middle of the solution / don't let thermometer touch the beaker</p> <p>ALLOW stir the solution</p>

	(b)	(i)	Linear scale on both axes ✓ Points plotted correctly ✓	<table border="1"> <thead> <tr> <th>Volume of acid (cm³)</th> <th>Temperature (°C)</th> </tr> </thead> <tbody> <tr><td>0</td><td>18</td></tr> <tr><td>5</td><td>20</td></tr> <tr><td>10</td><td>23</td></tr> <tr><td>15</td><td>26</td></tr> <tr><td>20</td><td>27</td></tr> <tr><td>25</td><td>26</td></tr> <tr><td>30</td><td>24</td></tr> </tbody> </table>	Volume of acid (cm ³)	Temperature (°C)	0	18	5	20	10	23	15	26	20	27	25	26	30	24	2	2 x 2.2	x-axis must begin from 0 ALLOW ±½ small square ALLOW bar chart or histogram MP2 is dependent on MP1 IGNORE any line of best fit
Volume of acid (cm ³)	Temperature (°C)																						
0	18																						
5	20																						
10	23																						
15	26																						
20	27																						
25	26																						
30	24																						
		(ii)	(As the acid is added) the temperature increases ✓ Idea that after 20 cm ³ (of acid is added) / after the reaction is complete, the temperature decreases ✓	2	2 x 3.1a																		
		(iii)	The temperature increases ✓	1	2.1	ALLOW the reaction gets hotter IGNORE idea that energy / heat is released																	
	(c)		Idea of the (minimum) amount of energy needed for a reaction to occur ✓	1	1.1	ALLOW idea of the (minimum) amount of energy for a successful collision (to occur)																	

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