Foundation

GCSE

Chemistry A (Gateway Science)

J248/01: Paper 1 (Foundation 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.

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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. 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 **20(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

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
I	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**.

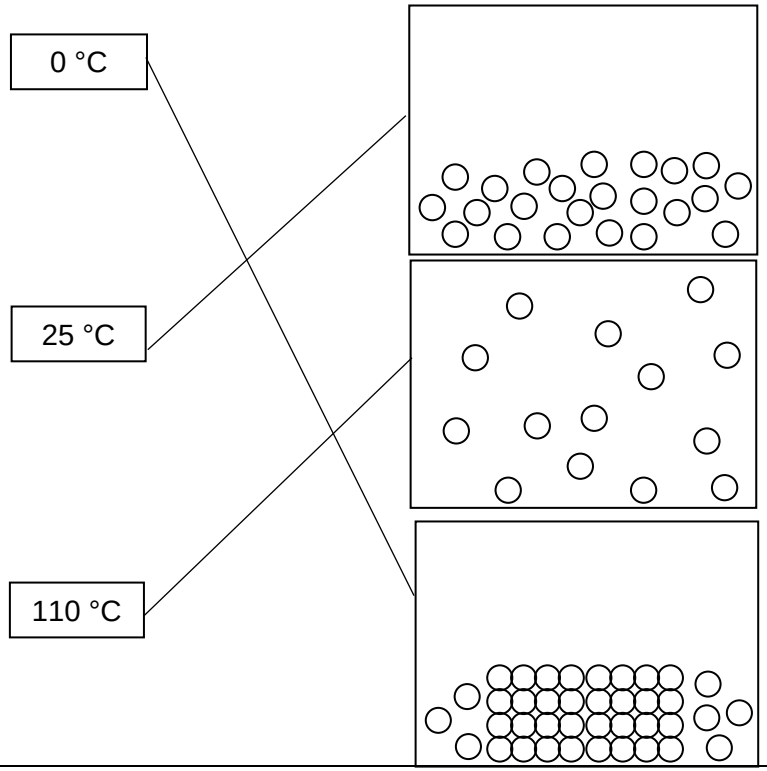
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Chemistry 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	D ✓	**1**	**2.1**	
3	A✓	**1**	**1.1**	
4	C ✓	**1**	**1.1**	
5	B ✓	**1**	**1.2**	
6	A ✓	**1**	**1.1**	
7	B ✓	**1**	**1.1**	
8	B ✓	**1**	**2.1**	
9	B ✓	**1**	**2.2**	
10	D ✓	**1**	**2.2**	
11	B ✓	**1**	**2.1**	
12	B ✓	**1**	**2.2**	
13	C ✓	**1**	**1.2**	
14	D ✓	**1**	**1.2**	
15	B ✓	**1**	**2.2**	

Question			Answer	Marks	AO element	Guidance
16	(a)			2	2 x 1.2	Any one correct = one mark All three correct = two marks
	(b)	(i)	8 ✓	1	2.1	
		(ii)	0 ✓	1	2.1	
		(iii)	+1 / 1+ ✓	1	1.1	**ALLOW** + **IGNORE** positive
	(c)		Model 3 ✓ Idea that model 3 is a 3D model ✓	2	2 x 3.2b	 **IGNORE** gives size of molecule / can be visualised / gives the shape

Question			Answer	Marks	AO element	Guidance
	(d)		Hydrogen gains oxygen ✓	**1**	**2.1**	**ALLOW** H has bonded with oxygen / it has joined with oxygen / oxygen has been gained **IGNORE** water is formed / loss of electrons / molecule **DO NOT ALLOW** mixed with oxygen

Question			Answer	Marks	AO element	Guidance
17	(a)		Measuring cylinder / pipette ✓ pH meter ✓	2	2 x 1.2	
	(b)		The student is partly correct ✓ Universal indicator turns red in acid **AND** green in neutral solutions ✓ Universal indicator is blue in alkali / not yellow in alkali ✓	3	3 x 3.2a	 **ALLOW** red when no alkali added **AND** green when neutral **ALLOW** purple
	(c)		**First check the answer on the answer line** **If answer = 24.1 (cm^3) award 3 marks** 24.2 + 24.4 + 23.9 + 24.0 / 96.5 ✓ 24.2 + 24.4 + 23.9 + 24.0 ÷ 4 / 96.5 ÷ 4 / 24.125 ✓ **3 sig figs:** = 24.1 (cm^3) ✓	3	3 x 1.2	**NOTE** 96.5 scores 1 mark 24.125 scores 2 marks **ALLOW ECF** from incorrect total volume **ALLOW ECF** if significant figures are correct from incorrect calculation of mean volume
	(d)		Salt ✓ Water ✓	2	2 x 1.1	 **ALLOW** H_2O
	(e)		H^+ **AND** OH^- ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
18	(a)		**First check the answer on the answer line** **If answer = 9000 (kg) award 3 marks** Correctly takes 50 and 30 from chart ✓ (50-30) = 20 (%) ✓ $\frac{45{,}000 \times 20}{100}$ = 9000 (kg) ✓	3	3 x 2.2	**ALLOW ECF** from incorrect percentage
	(b)	(i)	Idea that a covalent bond is a shared **pair** of electrons (between atoms) ✓	1	1.1	
		(ii)	**Any two from:** Plastic bag polymer stretches or plastic bottle polymer is rigid / plastic bottle polymer is hard(er than plastic bag) polymer ✓ Polymer used for plastic bottle will have high(er) melting point (than plastic bag polymer) ✓ Plastic bottle polymer is strong(er than plastic bag polymer) ✓ Plastic bag polymer has weak intermolecular forces ✓ Plastic bottle polymer has strong cross-links ✓	2	2 x 2.1	**ORA** **ALLOW** bottle has a (more) fixed shape / bag doesn't have a fixed shape **ALLOW** Plastic bag polymer is flexible / plastic bottle polymer is not flexible/is hard to squeeze **IGNORE** elastic / brittle **ALLOW** hard to break for strong **IGNORE** thicker and thinner

	(c)		**Any two from:** Rulers need to be rigid ✓ (stretch makes) scale/lines/graduations stretch apart ✓ measurements are incorrect / too small ✓	**2**	**2 x 3.1b**	 **IGNORE** rulers should not be stretchy **ALLOW** inaccurate / different / reading is too small **ALLOW** measurements would stretch
	(d)	**(i)**	The lower the melting point, the further the sample can stretch (before breaking) / **ORA** ✓	**1**	**3.1a**	**ALLOW** the lower the melting point the higher the distance (stretched before breaking)
		(ii)	C_2H_2O ✓	**1**	**2.2**	**ALLOW** $C_2H_2O_1$ **ALLOW** any order of symbols **DO NOT ALLOW** C^2H^2O / C2H2O

Question			Answer	Marks	AO element	Guidance
19	(a)	(i)	Na_2SO_4 ✓	1	2.1	**ALLOW** SO_4Na_2 **DO NOT ALLOW** splitting of SO_4
		(ii)	aqueous / dissolved in water ✓	1	1.1	**ALLOW** solution **IGNORE** soluble in water **DO NOT ALLOW** liquid
		(iii)	Method for gas collection (such as gas syringe, displacement of water in upturned tube) ✓ Clear illustration of ALL gas being directed into gas collection apparatus (bung on top of conical flask) / method will work successfully as drawn ✓	2	2 x 3.3a	
	(b)	(i)	Both points correctly plotted ✓	1	1.2	± ½ small square
		(ii)	Curve of best fit accurately drawn ✓	1	2.2	± small square of all of the points unless bii points are anomalous **DO NOT ALLOW** double lines / feathering / breaks in the line / drawn point to point with a ruler
		(iii)	4.8 cm^3 ✓	1	2.2	**ALLOW** +/- 0.1 cm^3 **ECF**

Question			Answer	Marks	AO element	Guidance
		(iv)	Use a larger conical flask ☐ Use less sodium carbonate ☐ Use less sulfuric acid ☐ Use more sulfuric acid ☑ ✓	1	3.3b	

Question			Answer	Marks	AO element	Guidance
20	(a)*		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Detailed description of physical properties of metals and non-metals, correctly attributing metal properties to section A and non-metal properties to section B. Correctly identifies X as a metal/from section A. Contains properties extra to shiny and conducts electricity. *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 physical properties of metals and non-metals, correctly attributing metal properties to section A and non-metal properties to section B. *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 physical properties of metals/section A **OR** non-metals/section B. *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**	**2 x 1.1** **4 x 2.1**	**AO1.1 – Demonstrates knowledge and understanding of structures and bonding.** • Section A contains metals. • Section B contains non-metals. • Element X is from section A, as section A contains metals and metals are shiny and conduct electricity. **AO2.1 – Applies knowledge and understanding of physical properties of metals and non-metals.** <u>Examples of physical properties of elements:</u> • Metals (or section A elements) are shiny, malleable, ductile, sonorous. • Non-metals (or section B elements) are dull, brittle. • Metals are good conductors of electricity and heat. • Non-metals are poor conductors of electricity and heat. • Metals have high melting and boiling points • Non-metals have low melting and boiling points

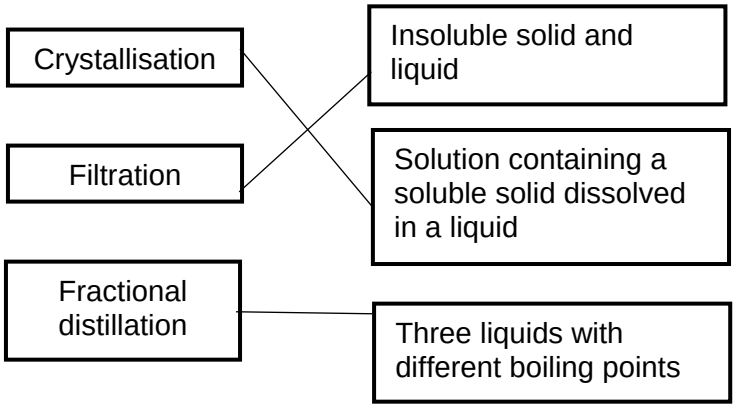
Question			Answer	Marks	AO element	Guidance
	(b)		Properties ✓ Were undiscovered ✓ Left gaps for ✓	**3**	**3 x 1.1**	
	(c)		Group 0 elements have a full outer shell (of electrons) ✓ Group 1 elements will react (lose an electron) to form a full outer shell (of electrons) ✓	**2**	**2 x 1.1**	**ALLOW** references to helium for Group 0 and lithium for Group 1 **ALLOW** one mark for the idea that a complete outer shell of electrons is a stable configuration, if no other mark gained **ALLOW** helium has a filled shell **ALLOW** Group 1 elements are reactive because they don't have a filled outer shell of electrons. **ALLOW** Group 1 elements will lose an electron to form a full outer shell (of electrons)

Question			Answer	Marks	AO element	Guidance
21	(a)		Seven ✓	1	2.2	
	(b)		**First check the answer on the answer line** **If answer = 2.4 x 10^{7} award 3 marks** 4.0 x 10^{-3} ÷ 1.7 x 10^{-10} ✓ = 23529412 ✓ Standard form and 1 d.p.. = 2.4 x 10^{7} ✓	3	2 x 2.1 1 x 1.1	**ALLOW ECF** if standard form and decimal places are correct from incorrect calculation
	(c)		**Any two from:** Each (carbon) atom forms 4 bonds ✓ All the (outer shell) electrons are used in bonding ✓ No electrons are able to move to conduct electricity ✓	2	2 x 1.1	**ALLOW** has no delocalised electrons / no sea of electrons **IGNORE** free electrons / ions **ALLOW** electrons cannot move (through the structure) **IGNORE** electrons cannot carry the charge
	(d)	(i)	(Form of carbon) X ✓ An electrode needs to conduct electricity ✓	2	2 x 3.2a	 **IGNORE** other properties

Question			Answer	Marks	AO element	Guidance
21	(d)	(ii)	Electrodes need to remain liquid, and not freeze at low temperatures ☐ Electrodes need to remain liquid, and not melt at high temperatures ☐ Electrodes need to remain solid, and not freeze at low temperatures ☐ Electrodes need to remain solid, and not melt at high temperatures ☑ ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
22	(a)	(i)	**First check the answer on the answer line** **If answer = 7.5 : 1 award 2 marks** 1.5 ÷ 0.2 = 7.5 ✓ 0.2 ÷ 0.2 = 1 ✓	**2**	**2 x 2.1**	If no answer given on answer line, check table. **ALLOW** 15:2 for 1 mark
		(ii)	As the surface area to volume ratio <u>increases/gets larger</u>, the tablet will take <u>less</u> time to dissolve ✓ **OR** As the surface area to volume ratio <u>decreases/gets smaller</u>, the tablet will take <u>more</u> time to dissolve ✓	**1**	**3.1a**	**ALLOW** shorter for less time **IGNORE** faster for less time **ALLOW** longer for more time **IGNORE** slower for more time
		(iii)	(Tablet D) has the highest / higher surface area <u>to volume ratio</u> ✓ So it will take less / least time to dissolve / dissolves faster / fastest ✓	**2**	**2 x 3.1b**	**No mark for no; marks are for explanation** **Answer must be comparative** **ALLOW** (Tablet D) has the highest / higher <u>ratio</u> **ALLOW** Tablet D does not have smallest surface area <u>to volume ratio</u> so will not dissolve slowest ✓ Tablet C will dissolve slowest as has smallest surface area to volume ratio ✓

	(b)	**(i)**	(Use a) locating agent / stain / UV light ✓	**1**	**1.2**	**ALLOW** specific locating agents / stains e.g., iodine, ninhydrin, methylene blue, dye **IGNORE** ink / (universal) indicator / food colouring / food dye **IGNORE** Use blue light
		(ii)	**First check the answer on the answer line** **If answer = 0.73 / 0.733 award 3 marks** R_f value = distance moved by spot ✓ distance moved by solvent = 4.4 ÷ 6.0 ✓ = 0.73 ✓ **OR** distances moved = 4.4 and 6.0 ✓ R_f value = distance moved by spot / 4.4 ✓ distance moved by solvent 6.0 = 0.73 ✓	**3**	**1.2** **2 x 2.2**	**ALLOW ECF** from incorrect distances **ALLOW** 0.7 for 0.73 **ALLOW ECF** from incorrect distances **ALLOW** 0.7 for 0.73

Question			Answer	Marks	AO element	Guidance
23	(a)		 ✓✓	2	2 x 1.2	Any one correct = one mark All three correct = two marks
	(b)	(i)	Use a water bath (instead of the Bunsen burner) / Use a heating mantle (instead of the Bunsen burner) ✓	1	3.3b	**ALLOW** use an (electric) heater / heating plate **ALLOW** idea of clamping the (round bottom) flask (to prevent it falling over)
		(ii)	Add a thermometer (to the top of the flask containing the mixture) ✓	1	3.3b	**ALLOW** use a temperature probe **DO NOT ALLOW** thermometer added to collection flask / receiving flask

Question			Answer	Marks	AO element	Guidance
	(c)		The empirical formula is CH_2. ☐ The melting point is lower than 35 °C. ✓ ✓ The pure liquid contains two compounds. ☐ The pure liquid is an element. ☐ The pure liquid will be a gas at above 35 °C. ✓ ✓	2	2 x 2.1	
	(d)		**First check the answer on the answer line** **If answer = 74.0 / 74 award 3 marks** 4 x 12.0 = 48.0 **OR** 2 x 12.0 = 24.0 ✓ 10 x 1.0 = 10.0 **OR** 5 x 1.0 = 5.0 ✓ (48.0 + 10.0 + 16.0) = 74.0 ✓	3	3 x 2.2	**IGNORE** any units given **ALLOW ECF** for addition of incorrect numbers of C, H and O if no other mark awarded

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