

Foundation

GCSE

Chemistry B Twenty First Century Science

J258/02: Depth in Chemistry (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2025

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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 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 questions on this paper are **3(b)(ii)** and **7(b)**

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 B:

	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	(a)	(i)	Hydrochloric acid / HCl ✓	1	2.1	
		(ii)	Sodium hydroxide / NaOH ✓	1	2.1	
		(iii)	Potassium hydroxide / KOH ✓	1	2.1	
		(iv)	Hydrochloric acid and sulfuric acid / HCl and H_2SO_4 ✓	1	2.1	
		(v)	Sulfuric acid / H_2SO_4 ✓	1	2.1	
	(b)		T T T F ✓✓✓	3	2 x 1.1 1 x 2.1	3 correct = 2 marks 2 correct = 1 mark
	(c)	(i)	indicator / litmus ✓ Colour changes (when NaOH is neutralised.) ✓	2	2.2	DO NOT ALLOW pH indicator/Universal indicator ALLOW other suitable indicators e.g. methyl orange, phenolphthalein etc. IGNORE specific colours
		(ii)	Burette ✓	1	3.3a	
		(iii)	Idea of checking that they are the same/similar/repeatable/increases repeatability ✓	1	3.3b	IGNORE ensuring accuracy/correctness

Question			Answer	Marks	AO element	Guidance
2	(a)		Water treatment process Aeration Distillation Filtration Purpose Separates pure water from salt water Uses oxygen to break down harmful waste Removes solid impurities	2	1.1	All correct = 2 marks 2 or 1 correct = 1 mark
	(b)		Blue litmus paper ✓ goes red then white ✓	2	1.2	
	(c)	(i)	Any two from: Deaths were higher before adding chlorine / did not fall ✓ Deaths fell after adding chlorine ✓ There were some increases followed by decreases ✓ No more deaths after about 1948 ✓ Deaths were falling before chlorine added ✓	2	3.1b	ALLOW went down to zero ✓✓
		(ii)	Data available only shows America ✓ Data only shows deaths from typhoid / does not show deaths from other causes / may be other harmful substances or microbes in the water ✓	2	3.2a	ALLOW other countries did not have access to chlorine
	(d)		Idea of other scientists looking at the data ✓ Idea of checking/verifying/examining data ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
3	(a)		Fe ✓ O ₂ ✓ (Oxygen)(g) AND (Iron(III) oxide)(s) ✓	3	2 x 1.1	DO NOT ALLOW FE or O ²
					1 x 2.1	ALLOW (aq) for oxygen
	(b)	(i)	First check the answer on the answer line. If answer = 71.5 (%) award 2 marks Shows in working $16.7 + 8.1 + 3.6 + 0.1$ OR 28.5 ✓ $100 - 28.5 = 71.5$ (%) ✓	2	2.1	

	(b) (ii)*	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) Describes properties for both types of steel AND makes judgements about why steel 1 is suitable AND why steel 2 is unsuitable. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Describes properties for both types of steel OR describes properties for one type of steel and makes a judgement about why steel 1 is suitable/steel 2 is unsuitable. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) States at least one property for each type of steel. OR makes a judgement about why steel 1 is more suitable. <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>	6	4 x 2.1 2 x 3.1b	AO2.1 Predicts properties of steel(s) • steel 1 is corrosion resistant • steel 1 is corrosion resistant at high temperatures and in sea water • steel 1 has higher electrical conductivity • steel 1 bends without breaking. • steel 2 is harder • steel 2 breaks easily • steel 2 is not corrosion resistant IGNORE properties not linked to data AO3.1b Evaluates the suitability of steel 1 vs steel 2 • Steel 1 suitable because it resists corrosion in seawater / is malleable IGNORE links to other properties • Steel 2 is not suitable because it breaks easily / is not corrosion resistant IGNORE links to other properties ALLOW Comparisons implied i.e. ‘hard’ rather than ‘harder’
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Question			Answer	Marks	AO element	Guidance															
4	(a)		<table><tr><td></td><td>True</td><td>False</td></tr><tr><td>Buckyballs are chemical compounds.</td><td></td><td>✓</td></tr><tr><td>Buckyballs are larger than carbon atoms.</td><td>✓</td><td></td></tr><tr><td>Diamond and graphite are examples of nanoparticles.</td><td></td><td>✓</td></tr><tr><td>Some nanoparticles are shaped as hollow tubes.</td><td>✓</td><td></td></tr></table> ✓✓✓		True	False	Buckyballs are chemical compounds.		✓	Buckyballs are larger than carbon atoms.	✓		Diamond and graphite are examples of nanoparticles.		✓	Some nanoparticles are shaped as hollow tubes.	✓		3	1.1	3 correct = 2 marks 2 correct = 1 mark
	True	False																			
Buckyballs are chemical compounds.		✓																			
Buckyballs are larger than carbon atoms.	✓																				
Diamond and graphite are examples of nanoparticles.		✓																			
Some nanoparticles are shaped as hollow tubes.	✓																				
	(b)		First check the answer on the answer line. If answer = 6(.0) award 2 marks. Correct substitution 3/0.5 shown in working ✓ 6(.0) ✓	2	2.1	IGNORE any units given															
	(c)		Nanoparticles are small enough to enter the brain. ✓ There is more data about uses of nanoparticles than about their effects on health ✓	2	1.1																

[illegible]

Question			Answer	Marks	AO element	Guidance
6	(a)		At the end of the reaction there will be some unreacted methane ✓ The equation includes a reversible symbol ✓	2	1.1	
	(b)	(i)	2 is because hydrogen is H ₂ / contains 2 atoms / 2 is the RFM of hydrogen ✓ 4 is the number in the equation for hydrogen ✓	2	2.2	
		(ii)	First check the answer on the answer line. If answer = 15.4(%) OR 15.38(4615...)(%) award 2 marks Substitutes 8 into correct place in equation OR shows total mass of all reactants = 52 ✓ Atom economy = 15.4 / 15.3846 (%).....✓	2	2.2	ALLOW truncation
		(iii)	First check the answer on the answer line. If answer = 44 award 2 marks Shows 12 and 16 in working ✓ Correct answer = 44 ✓	2	2.2	
	(c)	(i)	The carbon dioxide is a by-product rather than a waste product ✓ The carbon dioxide is not released into the air ✓	2	1.1	
		(ii)	hydrogen → only water ✓ methanol → carbon dioxide and water ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
7	(a)		Activation energy ✓ Energy (change) of reaction ✓	2	1.1	ALLOW energy released IGNORE endo/exothermic
	(b)*		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) Gives a method AND identifies control variables AND identifies the expected trend in temperature change. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Makes a statement about method and constant variables OR makes a statement about constant variables and expected results OR makes a statement about method and expected results. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Makes a statement about method OR constant variables OR expected results <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>	6	4 x 3.3a 2 x 3.1a	AO3.3a Gives a method - add compound to water and stir to dissolve - measure temperature before and after dissolving / measure temperature change when compound dissolves. - insulate the beaker AO3.3a Identifies variables to keep constant - Use the same volume/amount of water - Use the same amount/mass of compound - Use the same starting temperature DO NOT ALLOW constant temperature AO3.1a Predicts expected results - Temperature changes for all three compounds - Temperature of water decreases for all three compounds - Trend in temperature change is a bigger decrease from KCl → KBr → KI OR KCl has least temperature decrease and KI has greatest IGNORE references to same time.

Question			Answer	Marks	AO element	Guidance
8	(a)		Sodium hydroxide and hydrogen ✓ Sodium moves less quickly/(more) slowly / fizzes (more) slowly/less vigorously / fizzes gently ✓ No flame ✓	3	1 x 1.2 2 x 2.2	IGNORE sodium is less reactive than potassium ALLOW reaction is slower/less violent with sodium (than potassium). ALLOW water fizzes ALLOW no comparison e.g. fizzes/moves on the surface/forms a ball / (appears to) dissolve/disappear DO NOT ALLOW incorrect comparison e.g. moves quickly/fizzes violently ALLOW no sparking/no explosion ALLOW yellow/orange flame DO NOT ALLOW other colours for flame
	(b)	(i)	Lithium has one electron in the outer shell and is in Group 1 ✓ Fluorine has seven electrons in the outer shell and is in Group 7 ✓	2	2.1	ALLOW 1 mark for the group number is the same as the number of electrons in the outer shell. ALLOW outer shell = outer/highest energy level IGNORE orbital/rings IGNORE references to gaining/losing electrons IGNORE stated electronic configurations 2.1 and 2.7
		(ii)	Both (atoms) have the same number of shells of electrons / both (atoms) have two shells of electrons ✓	1	2.1	DO NOT ALLOW have the same number of outer shells ALLOW shell = energy level IGNORE orbital/rings

Question			Answer	Marks	AO element	Guidance
		(iii)	Shows charges on ions Li +1/1+/+ and F -1/1-/- ✓ Shows two shells with 8 electrons in outer shell of F ⁻ ✓ Seven electrons in outer shell of F ⁻ are dots and one is a cross ✓	3	2.1	DO NOT ALLOW MP2 if additional (occupied) shells are shown on Li ⁺ or F ⁻ / electrons drawn on first shell of F ⁻ IGNORE additional empty shell drawn for lithium ALLOW MP3 ECF if electrons added to first shell
		(iv)	It does not show that the ions are different sizes. ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
9	(a)		Hydroxide ions from water react to form oxygen ✓ Non-metals usually form at the positive electrode ✓	2	1.2	
	(b)	(i)	(instead of the test-tube use) a measuring cylinder / (upside down) burette ✓	1	3.3b	ALLOW gas syringe ALLOW graduated test-tube / description of test-tube with volume markings
		(ii)	volume of gas AND time / intervals of time / stated measurement of time e.g. one minute ✓ Rate is worked out by volume ÷ time / volume measured in a minute is rate (in cm ³) <u>per minute</u> ✓	2	1 x 3.3a 1 x 2.2	ALLOW for MP1 Take reading on gas syringe/measuring cylinder/graduated test-tube for 'volume'. ALLOW correct units for MP2 e.g. cm ³ /min or cm ³ /s ALLOW ECF for MP2 from 'counting bubbles' or 'measure the amount' 'change in mass' e.g. divide number of bubbles or amount of gas by the time. ALLOW idea of plotting a graph of volume vs time AND measuring gradient
	(c)		Mass of positive electrode stays the same <u>and</u> negative electrode increases ✓ Positive electrode: gas/oxygen forms ✓ Negative electrode: copper/metal/solid/coating forms ✓	3	1 x 2.2 2 x 3.2b	IGNORE values of mass change, even if incorrect IGNORE ions attracted to electrodes, even if identified incorrectly IGNORE 'gas/oxygen/copper is <u>attracted</u> to the electrode' alone DO NOT ALLOW <u>ions</u> are lost as gas DO NOT ALLOW <u>ions</u> are added onto the electrode

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