

# Foundation

## GCSE

### Chemistry B Twenty First Century Science

#### J258/01: Breadth in Chemistry (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. **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 a tick 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. 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

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

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	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**.

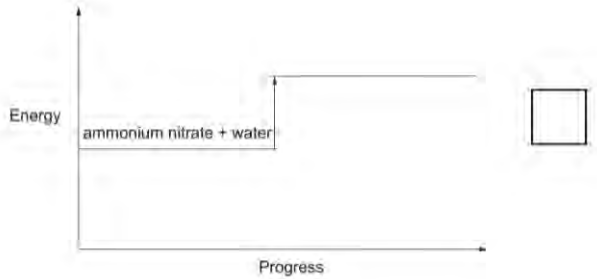
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Chemistry B:

	<b>Assessment Objective</b>
<b>AO1</b>	<b>Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.</b>
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
<b>AO2</b>	<b>Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.</b>
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
<b>AO3</b>	<b>Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.</b>
<b>AO3.1</b>	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
<b>AO3.2</b>	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.
<b>AO3.3</b>	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)	condensed ✓	1	1.1	
	(b)	photosynthesis ✓ carbon dioxide / CO <sub>2</sub> ✓	2	1.1	
	(c) (i)	rises and falls ✓ correct reference to data from the graph ✓	2	3.1a	The first marking point is for a statement about the trend shown by the relevant part of the graph.
	(ii)	0.22 ± 0.01 ✓	1	2.2	
	(iii)	(0.28 ÷ 0.04) = 7 ✓	1	2.2	

Question	Answer	Marks	AO element	Guidance
2 (a)	properties ✓ atomic ✓	2	1.1	
(b) (i)	Lithium <b>AND</b> Magnesium ✓	1	2.1	
(ii)	Electrical conductivity / AW ✓	1	1.1	
(iii)	All their melting points are above room temperature / 25°C ✓	1	1.2	
(iv)	number of protons ✓	1	1.1	<b>IGNORE</b> correct statements about electrons. <b>DO NOT ALLOW</b> 'protons and neutrons'
(c) (i)	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p style="color: blue; font-weight: bold;">Halogen</p> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">chlorine</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">iodine</div> </div> <div style="text-align: center;"> <p style="color: blue; font-weight: bold;">Appearance</p> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">Grey solid</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">Purple gas</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">Green gas</div> <div style="border: 1px solid black; padding: 2px; width: 60px; margin: 5px auto;">Brown liquid.</div> </div> </div> <p style="margin-top: 10px;">✓✓</p>	2	1.1	
(ii)	sodium chloride ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	Tick next to 2nd diagram ✓ 	1	1.2	
		(ii)	ammonium nitrate solution ✓	1	1.2	
		(iii)	Endothermic ✓	1	1.1	
	(b)		take temperature (of water) ✓ add ammonium nitrate (and stir) ✓ take final temperature ✓	3	3.3a	<b>ALLOW</b> inferred statements eg put thermometer into liquid  'Measure temperature change/difference' = 2 marks

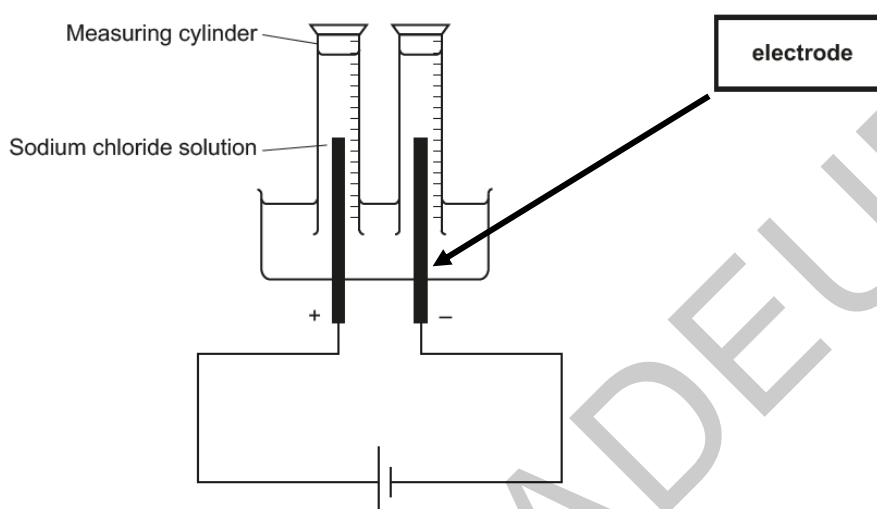
Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	point plotted at 142, 174 ✓	1	1.2	± 1
		(ii)	Line of best fit ✓	1	1.2	ALLOW ECF
		(iii)	149 (°C) ✓	1	2.2	ALLOW ECF from the candidate's graph ± 1
	(b)	(i)	C <sub>5</sub> H <sub>12</sub> ✓	1	2.2	
		(ii)	water ✓	1	1.2	
	(c)	(i)	1:3 ✓	1	2.2	ALLOW C:H3
		(ii)	CH <sub>3</sub> ✓	1	2.2	DO NOT ALLOW "2CH3" ALLOW ecf
	(d)		covalent ✓ shared ✓	2	2.1	
	(e)		It gives ethanol its chemical properties. ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	$\text{Mg} + \text{FeS} \rightarrow \text{MgS} + \text{Fe}$ ✓	1	2.1	
		(ii)	Magnesium / Mg removes/ displaces the sulfur (from Fe) ✓	1	2.2	ALLOW AW eg Mg replaces Fe
	(b)		quickly ✓ electrons ✓	2	1.1	

Question		Answer	Marks	AO element	Guidance												
6	(a)	Iron oxide is reduced ✓	1	2.1													
	(b)	<p><b>FIRST CHECK THE ANSWER ON ANSWER LINE</b>  <b>If answer is 70 (g) award 2 marks</b></p> <p><math>112 \times 100 \div 160</math> ✓  <math>= 70</math> (g) ✓</p>	2	2.2													
	(c)	Carbon ✓ Alloys ✓	2	1.1													
	(d)	water ✓ barrier ✓	2	1.1													
	(e)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 15%;">Advantage</th> <th style="width: 15%;">Disadvantage</th> </tr> </thead> <tbody> <tr> <td>Recycling steel uses much less energy than making iron and steel from iron ore.</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Materials must be collected and sorted.</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Raw materials (metal ores) are not used.</td> <td style="text-align: center;">✓</td> <td></td> </tr> </tbody> </table> <p>✓✓</p>		Advantage	Disadvantage	Recycling steel uses much less energy than making iron and steel from iron ore.	✓		Materials must be collected and sorted.		✓	Raw materials (metal ores) are not used.	✓		2	3.2a	all three correct = 2 marks two correct = 1 mark
	Advantage	Disadvantage															
Recycling steel uses much less energy than making iron and steel from iron ore.	✓																
Materials must be collected and sorted.		✓															
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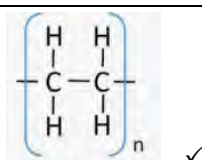
Question		Answer	Marks	AO element	Guidance
7	(a)	dioxide ✓	1	1.1	
	(b)	(i)	1	3.1b	<b>ALLOW</b> time decreases / compares the two times Assume powder is being referred to unless stated otherwise <b>IGNORE</b> 'powder reacts faster' [stem]
		(ii)	2	1.1	<b>ALLOW</b> collision arguments
	(c)	longer than 10 minutes ✓	1	3.2a	
	(d)	heat / evaporate ✓ [leave to] crystallise ✓	2	1.2	
	(e)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 67 (%) award 3 marks</b>  6.6 × 100 ÷ 9.8 ✓ = 67.3... (any decimal places) ✓ = 67 (%) (2 sf) ✓	3	2.2 x 2  1.2	

Question		Answer	Marks	AO element	Guidance
8	(a)	neutralisation ✓	1	1.1	
	(b)	run in (acid) from burette ✓ until (indicator) changes colour ✓	2	1.2	<b>DO NOT ALLOW</b> run in alkali
	(c) (i)	20.4(0) (cm <sup>3</sup> ) ✓	1	1.2	
	(ii)	more NaOH in Nobloc / Noblock more concentrated ✓ more acid used (in titration)✓	2	2.2	<b>DO NOT ALLOW</b> more acid in Noblock Second marking point is for a <u>reason</u> <b>ALLOW</b> inferred statement "Because the result was higher"

Question		Answer	Marks	AO element	Guidance
9	(a)	aluminium ✓ oxygen ✓	2	2.1	
	(b) (i)	electrode labelled on diagram ✓ 	1	1.2	BOD if it points to the sign, or the junction with the wire, rather than the electrode
	(ii)	<b>Any two from:</b> So the gas can be collected / AW ✓ So the gases do not mix / AW ✓ To preserve contact / conductivity / AW ✓	2	3.3b	
	(iii)	Hydrogen ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance												
10	(a)	(i)	Insoluble ✓	1	1.1													
		(ii)	<table border="1"> <thead> <tr> <th>substance</th> <th>mixture</th> <th>pure substance</th> </tr> </thead> <tbody> <tr> <td>copper sulfate crystals</td> <td></td> <td>✓</td> </tr> <tr> <td>graphite powder</td> <td></td> <td>✓</td> </tr> <tr> <td>copper sulfate + graphite</td> <td>✓</td> <td></td> </tr> </tbody> </table> ✓✓	substance	mixture	pure substance	copper sulfate crystals		✓	graphite powder		✓	copper sulfate + graphite	✓		2	2.1	all three correct = two marks two correct = one mark
substance	mixture	pure substance																
copper sulfate crystals		✓																
graphite powder		✓																
copper sulfate + graphite	✓																	
	(b)		A blue precipitate / solid made ✓  A white precipitate / solid made ✓	2	1.2													

Question		Answer	Marks	AO element	Guidance
11	(a)	H <sub>2</sub> ✓ (g) ✓	2	2.1	DO NOT ALLOW h <sub>2</sub>
	(b) (i)	<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> <b>If answer = 0.4 (cm<sup>3</sup>/s), award three marks.</b>  Volume after 1 minute = 24 (cm <sup>3</sup> ) ✓  1 minute = 60 s ✓  Rate = vol÷time / 24÷60 = 0.4 (cm <sup>3</sup> /s) ✓	3	2.2  1.2  2.2	ALLOW 25 (cm <sup>3</sup> ) ALLOW ECF on incorrect volume for MP2 and MP3  ALLOW 0.416666.../0.42 (from reading of 25) ALLOW MP3 for volume÷time if time is left in minutes  IGNORE incorrect rounding (assessed elsewhere)
	(ii)	The gas/hydrogen given off has mass/weight / gas/hydrogen escapes from the flask ✓	1	3.2b	ALLOW 'it makes a gas' 'hydrogen is made' alone
	(c)	reaction is faster / rate increases ✓  (define catalyst) catalysts are unchanged at the end / are not used up ✓  (evidence) the colour change (from blue to colourless) <u>shows that</u> copper sulfate is not a catalyst/shows that copper sulfate is used up ✓	3	3.1b	IGNORE 'more gas is produced in the first minute' IGNORE 'catalysts speed up reactions' alone  ALLOW 'it' for copper sulfate throughout.  IGNORE 'blue colour changes to colourless' alone (both in the question)
	(d)	The particles are moving faster ✓  There are more frequent collisions ✓	2	1.1	

Question		Answer	Marks	AO element	Guidance															
12	(a)	poor ✓ hard ✓	2	1.1	<b>ALLOW</b> does not conduct															
	(b)	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"></td> <td style="text-align: center; border-bottom: 1px solid black;">Material</td> <td style="text-align: center; border-bottom: 1px solid black;">Property</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px; text-align: center;">Aluminium</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">Softens easily when heated.</td> <td style="border: 1px solid black; padding: 5px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px; text-align: center;">Poly(ethene)</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">Goes out of shape if dropped.</td> <td style="border: 1px solid black; padding: 5px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px; text-align: center;">Pottery</td> <td style="border: 1px solid black; padding: 5px; text-align: center;">Breaks if dropped.</td> <td style="border: 1px solid black; padding: 5px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;"></td> <td style="border: 1px solid black; padding: 5px; text-align: center;">Rusts quickly.</td> <td style="border: 1px solid black; padding: 5px;"></td> </tr> </table> <p>✓✓✓</p>		Material	Property	Aluminium	Softens easily when heated.		Poly(ethene)	Goes out of shape if dropped.		Pottery	Breaks if dropped.			Rusts quickly.		3	2.1	One mark for correct choice for each material  If two lines from a material, that material is incorrect.
	Material	Property																		
Aluminium	Softens easily when heated.																			
Poly(ethene)	Goes out of shape if dropped.																			
Pottery	Breaks if dropped.																			
	Rusts quickly.																			
	(c)		1	2.2	<b>ALLOW</b> answer without brackets or n  Bonds at each side must be shown															
	(d)	nucleotides ✓	1	1.1																

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