OCR
Oxford Cambridge and RSA

Foundation

GCSE

Combined Science B Twenty First Century Science

J260/02: Chemistry (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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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.

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. 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 is 5c

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.

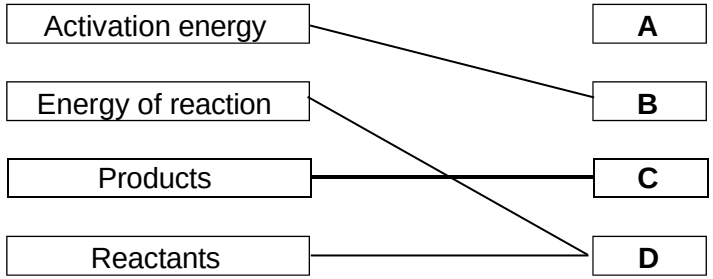
You should ensure that you have copies of these materials.

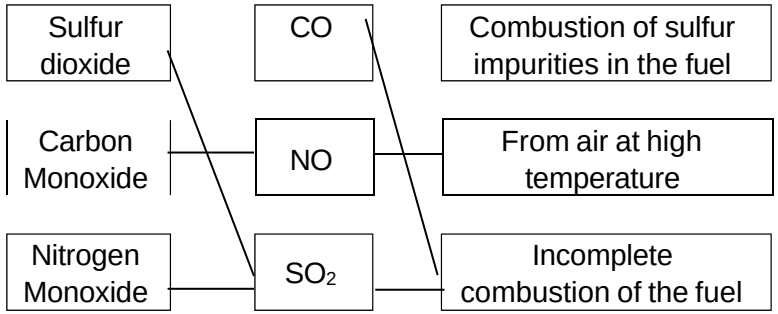
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

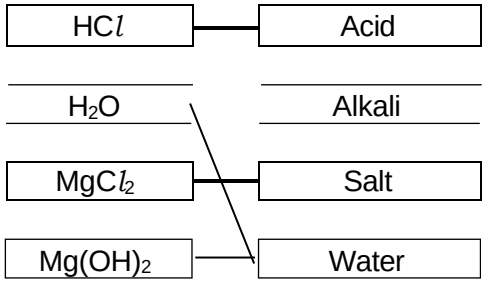
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science 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)	Nitrogen ✓ Hydrogen ✓ Oxygen ✓	3	2.1	**ALLOW** in any order
		(ii)	9 ✓	1	2.1	
	(b)	(i)	Endothermic ✓	1	1.1	
		(ii)	 ✓✓✓	3	1.2	Four correct = 3 marks Three or two correct = 2 marks One correct = 1 mark
	(c)		Balance ✓ Thermometer ✓	2	3.3a	1st box 6th box
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 16,200(J) award 3 marks** 20.2 - 4.8 / 15.4 ✓ 4.2 x 250 x 15.4 / 16170 ✓ Answer to 3 sf / 16200 ✓	3	**2.2 x 2** **1.2**	**16170 scores 2 marks** **ALLOW** ECF from incorrect calculation of temperature change

Question			Answer	Marks	AO element	Guidance
2	(a)		 ✓✓✓✓	4	1.1	Six correct = 4 marks Four or five correct = 3 marks Two or three correct = 2 marks One correct = 1 mark
	(b)	(i)	The reaction has a high activation energy. ✓	1	2.1	1st box
		(ii)	Bigger surface area ✓	1	3.2a	**ALLOW** smaller volume/less metal needed.
	(c)		CO / carbon monoxide ✓ Gained oxygen ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	2 **AND** 2 ✓	1	1.2	
		(ii)	 ✓✓✓	3	1.1	Four correct = 3 marks Three or two correct = 2 marks One correct = 1 mark
	(b)		H+ (ions from an) acid ✓ OH- (ions from an) alkali ✓ water ✓	3	1.1	**ALLOW** either order as long as they are in the correct pairings
	(c)		When the indicator changes colour. ✓	1	2.2	4th box
	(d)		Burette ✓	1	1.2	
	(e)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 27.25(cm^3) award 2 marks** Omits outlier ✓ Adds volumes and divides by number of readings (27.2 + 27.3 + 27.2 + 27.3 / 4 = 27.25) ✓	2	1.2	**ALLOW** 27.66 for correct calculation without omitting outlier for 1 mark✓
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 27.27…(cm^3) award 3 marks** 1200 ÷ 1000 / 1.2 ✓ 1.2 ÷ 0.044 ✓ = 27.27… ✓	3	1.2 2.2 x 2	**IF** final answer incorrect marks can be scored from displayed working, incorrect answer with no working scores 0 **ALLOW** ECF if mass not converted from mg to g, ie a final value of 27272(.72) scores 2 marks

Question			Answer	Marks	AO element	Guidance
4	(a)		Boiling point – high AND low ✓ Density – high AND low ✓ Appearance – shiny AND dull ✓	3	1.1	**ALLOW** appearance of Oxygen as colourless/none
	(b)		Electrons ✓ Mobile ✓	2	1.1	If there are no words ringed/underlined then the correct answer may be written in the space provided.
	(c)	(i)	Sodium – 3 **AND** 1 ✓ Oxygen – 2 **AND** 16/6 ✓	2	1.2	**ALLOW** 1 mark for any correct COLUMN
		(ii)	2.8 **AND** 2.8 ✓ +1/1+ ✓ -2/2- ✓	3	2.1	**ALLOW** '+' on its own for charge on sodium ion

Question			Answer	Marks	AO element	Guidance
5	(a)		dyes ✓ distributed ✓ paper **AND** stationary ✓ solvent **AND** mobile ✓	4	1.2	MP 3 & 4 can be in either order, but must be correct pairings.
	(b)		Identifies Sunshine Yellow ✓ Chooses 3.5 and 8.3 ✓ Rf = 3.5 ÷ 8.3 = 0.42(16) ✓	3	3.1b	

	(c)*		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 a method that could be used, including some relevant fine detail **AND** measurements required to calculate Rf value. *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)** Describes a basic method **AND** measurements (implied) that are required to calculate Rf value **OR** Describes a method that could be used, including some relevant fine detail *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)** Describes a basic method **OR** Measurements required to calculate Rf value *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**	**4 x 1.2** **2 x 2.2**	**AO1.2 Demonstration of knowledge of method** **Basic method** • solvent/water in beaker • dye on paper • dye on start line • paper into water/solvent • leave for water/solvent to rise **Relevant fine detail** • starting line in pencil. • Pencil is insoluble/will not run • start line approx. 1cm from bottom of paper • small spot of dye • solvent below starting line • solvent rises through spot of dye • leave until solvent nearly at the top • allow chromatogram/paper to dry • draw around spot • measure distances with a ruler **AO2.2 Applying knowledge and understanding to identify exact measurements required** • distance from starting line to dye • distance from starting line to solvent front

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td>(i)</td><td>There is only one type of atom in all of the structures. ✓</td><td>1</td><td>2.2</td><td>1st box</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>
<table>
<tr><th></th><th>True only for diamond</th><th>True only for fullerenes</th><th>True for both structures</th></tr>
<tr><td>Each carbon is bonded to 3 others.</td><td></td><td>✓</td><td></td></tr>
<tr><td>All atoms held together by covalent bonds.</td><td></td><td></td><td>✓</td></tr>
<tr><td>Carbons are arranged in a tetrahedral (pyramidal) shape.</td><td>✓</td><td></td><td></td></tr>
</table>
✓✓✓</td><td>3</td><td>2.1</td><td>More than 1 tick (✓) in any row is CON for that row.</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>≤100nm ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>They are small enough to pass through body tissues. ✓

They can fit molecules inside them. ✓</td><td>2</td><td>2.1</td><td>1st box

3rd box</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Risk - may cause damage/may be harmful to body/long term issues unknown/side effects unknown✓

Benefit - may cure disease / drugs transported easily(to point of action) ✓</td><td>2</td><td>2.1</td><td>DO NOT ALLOW <u>skin cancer,</u> but allow may cause cancer,

e.g. (targeted) delivery of chemotherapy drugs into cancer tumour. DO NOT ALLOW ‘carry drugs into the human body’ – given in stem of question.</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	Fluorine ✓	1	1.2	
		(ii)	Astatine ✓	1	1.2	
		(iii)	Black/dark grey **AND** solid ✓ Heated very strongly/reaction is very slow ✓ Produces iron astatide ✓	3	3.2a	**ALLOW** slower than Iodine
	(b)	(i)	Ions: K^+ and F^- ✓ Formula: $CaBr_2$ ✓	2	2.2	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 112.8 award 2 marks** Use of 55.8 **AND** 19.0 ✓ 55.8 + (19x3) = 112.8 ✓	2	2.2	If nothing written in the answer space please check in the table 74.8 on its own scores 0, must be clear evidence of use of 55.8 and 19.0

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	Molecular formula: C_5H_{12} ✓ Empirical formula: C_4H_9 ✓	2	2.2	
		(ii)	90-102 °C ✓	1	3.2a	If space left blank check table.
		(iii)	Liquid ✓ (Room temperature) above melting (point) and below boiling (point) / between the melting (point) and the boiling (point) ✓	2	3.2b	If answer incomplete check table Mark independently. **ALLOW** shown in a temperature scale showing room temperature between melting and boiling points **IGNORE** if just quotes the melting and boiling points
	(b)	(i)	**Any two from:** increase by CH_2 each time ✓ melting points increase ✓ boiling points increase ✓ state at room temperature goes from gas to liquid to solid ✓ same functional group ✓	2	3.1a	**IGNORE** similar chemical/physical properties **ALLOW** increase in number of carbons each time/ **IGNORE** molecular formula increases / increase of 2 hydrogens each time
		(ii)	hydrocarbons ✓ alkanes ✓ C_nH_{2n+2} ✓	3	1.1 2.1 1.1	

Question			Answer	Marks	AO element	Guidance
9	(a)	(i)	250(s) ✓	1	1.2	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 2.2(g) award 2 marks** 150.3 ✓ 152.5-150.3=2.2(g)✓	2	1.2	Look on graph if reading not given in working **ALLOW** ECF from incorrect reading from graph **IGNORE** +/-
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.0088 (g/s) award 2 marks** 2.2/250 ✓ = 0.0088 (g/s))✓	2	2.2	**ALLOW** 0.009 (g/s) for 2 marks **ALLOW** ECF from (a)(i) and (a)(ii) (a)(ii) ÷ (a)(i) correctly evaluated scores 2 marks **ALLOW** correct evaluation of a mass ÷ (a)(i) for 2nd marking point. E.g. 152.5 ÷ 250 = 0.61 even if mass is not same as in (a)(i) **ALLOW** (a)(i) ÷ (a)(ii) correctly evaluated scores 1 marks **IGNORE** +/-
	(b)		Steeper than original line with about the same initial mass ✓ Levelling off at about the same mass ✓	2	2.2	**DO NOT ALLOW** line above original line **DO NOT ALLOW** starting mass higher than 152.5 Tolerance of +/- 2 small squares
	(c)		larger than ✓ the same as ✓	2	2.1	

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