Foundation

GCSE

Chemisty B Twenty First Century Science

J258/01: Breadth in Chemistry (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

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.

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:

a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks

b. 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 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.

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.

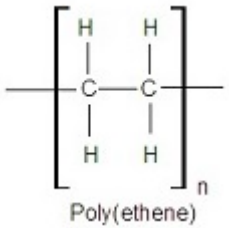
You should ensure that you have copies of these materials.

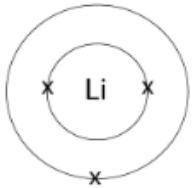
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New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

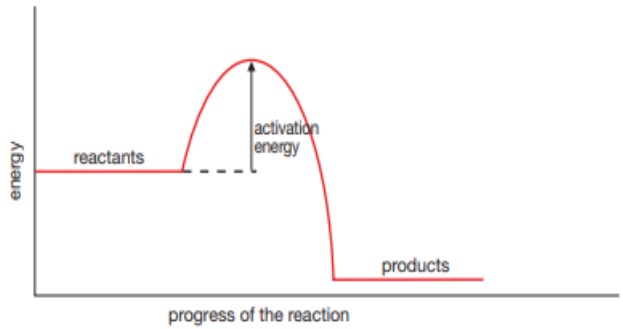
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

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)	Hydrogen ✓	1	1.1	
		(ii)	Crude Oil ✓	1	1.1	**ALLOW** fossil fuel **IGNORE** oil / alkanes / named fuel / organic matter
	(b)		Methane ✓	1	1.1	
	(c)		Polymers are all made from alkenes. ✓ Polymers are long chain molecules. ✓ Polymers can be synthetic or naturally occurring. ✓	2	1.1	3 correct = 2 marks 2 or 1 correct = 1 mark
	(d)	(i)	 Poly(ethene) Repeating unit has a single bond between carbon atoms ✓ Repeating unit fully correct with single bonds to four hydrogen atoms and continuation lines ✓	2	2.1	MP2 dependent on MP1. Brackets and n are not required.
		(ii)	Double bond in ethene breaks ✓ Form a chain / repeating unit ✓	2	2.1	**ALLOW** 'lose their double bond' **IGNORE** 'Connects with another monomer' not enough [The question already says that they react together to form a polymer, poly(ethene)]

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	**Any one from**: Soft ✓ Low melting/boiling point ✓ Conducts heat/electricity ✓	1	1.1	**ALLOW** solid / malleable / silvery / shiny **IGNORE** dull / weak /
		(ii)	3 electrons identified ✓ Structure as shown  ✓	2	2.1 1.1	Note: Beware of heavily crossed out - allow final version
	(b)		Lithium Hydroxide ✓ H_2O ✓ aq ✓ H_2 ✓	4	1.2	**ALLOW** effort has been made to show the subscript in H_2O **DO NOT ALLOW** lower case h in H_2O
	(c)	(i)	increases ✓	1	1.1	**ALLOW** warms up **DO NOT ALLOW** T surroundings increase AND T reactants decreases **IGNORE** releases heat **IGNORE** non-temperature related comments

Question			Answer	Marks	AO element	Guidance
		(ii)	 ✓ 	1	1.1	**ALLOW** Double headed arrow **OR** single headed arrow pointing upwards. **ALLOW** lack of precision, so long as it clearly represents the energy hump Note: Dotted horizontal line not needed
		(iii)	The energy needed for a reaction to occur ✓	1	1.1	**ALLOW** Energy to break bonds, the minimum energy that allows it to react **IGNORE** Incorrect detail

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	Filtration ✓	1	1.2	**ALLOW** screening or any term which implies removal of solid material eg sieving / gridding / riddling **IGNORE** general terms such as purification / separation / collection / extraction **IGNORE** words which are from the stem eg 'removal'
		(ii)	litmus ✓ Bleaches / turns white ✓ Detail - damp/ blue/ turns red/pink [before bleaching] ✓	3	1.2	**IGNORE** other named indicators E.g. 'add indicator and it turns pink' = MP3 for detail only
	(b)	(i)	Filter / funnel **and** [conical] flask ✓	1	1.2	**ALLOW** funnel and flask / filter and flask **DO NOT ALLOW** 'filtering tube
		(ii)	Reference to filter paper ✓ Impurities stay in paper / funnel **or** 'clean' water goes through / [only] the liquid goes through ✓	2	2.2	**ALLOW** catches the impurities / catches larger impurities **IGNORE** 'removes' (from stem)

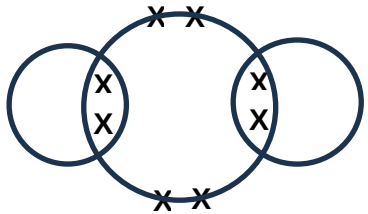
Question			Answer	Marks	AO element	Guidance
4	(a)		Alloy ✓	1	1.1	
	(b)		Low density so lightweight ✓ High (tensile) strength means strong / doesn't break ✓	2	3.2a	Must name the property, quote value **or** comment on size, **and** discuss why useful – eg tensile strength, high, strong **ALLOW** high melting point so will not melt **IGNORE** numbers unless comparison **IGNORE** Ideas not from table
	(c)	(i)	10 ✓	1	2.2	
		(ii)	1 ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	⇌ ✓	1	1.1	**ALLOW** reference to 'the arrow / symbol'
		(ii)	The same as ✓	1	1.1	
		(iii)	It speeds up the reaction. ✓	1	1.1	
	(b)	(i)	Idea of increases then decreases ✓ Added detail e.g. decreases steeply then levels off / two dates / two quantities ✓	2	3.1a	Numbers quoted must be correct **IGNORE** incorrect units
		(ii)	1990 ✓	1	3.1a	
		(iii)	(Sulfur dioxide can form) acid rain ✓	1	1.1	**ALLOW** corrosion of buildings / breathing problems / kills plants / deforestation **IGNORE** air pollution / greenhouse effect / it's bad for …
		(iv)	Low sulfur fuels ✓	1	1.1	**ALLOW** more fuel efficiency/reduce use of cars / any sensible suggestion **IGNORE** use 'different' fuel, must give some detail **IGNORE** catalytic converters / speed cameras / MOT tests / ULEZ

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	Neutralisation ✓	1	1.2	**ALLOW** acid-base **IGNORE '**chemical'
		(ii)	Sodium chloride ✓	1	2.1	
	(b)	(i)	37.2 – 36.6 = 0.6 cm^3 ✓	1	2.2	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer =36.5(cm^3) award 2 marks** (36.6 + 36.5 + 36.4)/3 ✓ = 36.5 (cm^3) ✓	2	2.2	**DO NOT ALLOW ECF**
		(iii)	(Colour change) shows ✓ When reaction complete ✓	2	1.2	**ALLOW** to see / to tell (to *indicate* the otherwise unobservable) **IGNORE** 'to measure' 'to know' **ALLOW** when right amount added / when to stop
		(iv)	**Any one from** Take readings at eye level ✓ take readings from (bottom of) meniscus ✓ make sure no air in burette ✓ add (the HCl) drop by drop ✓	1	3.3a	**IGNORE** repeat / take a mean

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	Dalton ✓	1	1.1	**ALLOW** John Dalton ✓
		(ii)	Plum pudding model ✓	1	1.1	
	(b)		(Electron) shells ✓	1	1.1	**ALLOW** energy levels / shell / outer shell **DO NOT ALLOW** nuclear shell / atomic shell

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	4 Fe ✓ + 3 O_2 ✓ → $2Fe_2O_3$	2	2.2	
		(ii)	Fe^{3+} ✓	1	3.1b	
	(b)		Metal 1 ✓ **Any two from** High melting point ✓ high density ✓ no reaction [in water] ✓	3	3.2b	Must comment on the **size** of MPt / density
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 76 award 3 marks** (4.4 x 100) / 5.8 ✓ =75.862….. ✓ 76 ✓	3	 2 x 2.2 1.2	75.86 with no working = 2 marks 75 with no working = 1 mark only **ALLOW ECF** for wrong numbers substituted into correct form of calculation **ECF** for sig figs if their answer needs rounding to two sig figs.

Question			Answer	Marks	AO element	Guidance
9	(a)	(i)	Low melting / boiling point ✓ Little <u>energy</u> is needed (to separate the molecules/ break the weak intermolecular forces) ✓	2	3.1a	Must comment on **size** of MPt/BP eg 'low' / 'only' **IGNORE** 'water is a liquid', the table doesn't show room temperature, only that it has low MPt & BPt **IGNORE** 'weak bonds'/ 'break bonds', separation must imply of complete molecules
		(ii)	covalent bonds ✓ (Each carbon has) four bonds (to other carbons) ✓	2	1.1	 **ALLOW** tetrahedral **IGNORE** pyramid
		(iii)	Only two shared pairs ✓ Only two lone pairs ✓ 	2	2.1	**IGNORE** inner shell if drawn on oxygen
	(b)	(i)	delocalised electrons ✓ free to move across the layer / sheet ✓	2	1.1	**ALLOW** free electrons / sea of electrons
		(ii)	 Diamond hard because all strong bonds ✓ Graphite soft because layers slide over each other ✓	2	2.1	Must be clear which they are talking about **ALLOW** strong imf (bonding tested earlier) **IGNORE** giant structure arguments
	(c)	(i)	1×10^{-9} ✓	1	1.2	
		(ii)	hollow structure (allows them to carry other molecules) ✓ small size (allows them pass through the body) ✓	2	2.1	**ALLOW** can (carry) other **molecules** **IGNORE** it's a nanoparticle (given in stem)

Question			Answer	Marks	AO element	Guidance
10	(a)		Phosphorus / P✓ Potassium / K ✓	2	1.1	**IGNORE** other elements
	(b)	(i)	enters watercourses / eutrophication / increased algal growth/weed/plant growth in watercourses / kills fish/marine or river life / leads to oxygen depletion in water ✓	1	1.1	**IGNORE** bioaccumulation **IGNORE** more weeds unqualified **IGNORE** death of plants/animals/less biodiversity/poor soil fertility
		(ii)	There are not enough natural fertilisers / synthetic fertilisers can be manufactured in large quantities / need to grow more food/crops / lead to faster growth / more yield ✓	1	3.2a	**IGNORE** more plants alone **IGNORE** references to pesticides **IGNORE** 'cheaper' or cost arguments alone / easier to use / grow better / readily available **ALLOW** helps plants to grow **ALLOW** implied comparison e.g. high growth/fast growth **ALLOW** acts faster / described disadvantage of natural fertiliser e.g. smell / quantity needed

	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 81.6(%) award 4 marks** (mass of atoms in desired product) = 80.0 ✓ (total mass of atoms in reactants) = 35.0 + 63.0 (only) OR 98.0 ✓ atom economy = 80.0/98.0 x 100 OR = 81.6326…(%) ✓ 81.6 (%) ✓	**4**	**3 x 2.2** **1.2**	**Answer other than 81.6 is max 3** **ALLOW** 80 if shown as numerator in calculation (even if added to another number) **ALLOW MP2** anywhere (even if shown as numerator) **ALLOW** 35+63 (only) seen anywhere in calculation **DO NOT ALLOW** other numbers added to 35 + 63 **MP3** Must be correct substitution 80/98 x100 81.6326….. = 3 marks **MP4 ALLOW** incorrect answer, with working to 1dp

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	**Any 2 from:** electrostatic forces ✓ between oppositely charged ions / between positive ions and negative ions ✓ sodium ions are positively charged and chloride ions are negatively charged ✓	2	1.1	**IGNORE** attractive forces / static forces **ALLOW** electrostatic attraction **MAX 1** if single bonds /covalent bonds / imfs / delocalised electrons / protons and electrons are stated **ALLOW** cation = positive ion and anion = negative ion throughout **IGNORE** 'chlorine' ions **IGNORE** between sodium ions and chloride ions **ALLOW** 2 marks for 'attractive forces between positive sodium ions and negative chloride ions'
		(ii)	Model C does not show the 3-D arrangement of ions ✓ Only one model shows that chlorine is an anion ✓	2	3.1a	
		(iii)	electron arrangement of 2.8.8 drawn ✓ -1 / 1- / - ✓	2	2.2	**ALLOW** different symbols for electrons / all the same electron symbol
	(b)		Number of electron shells is the same as period number / sodium or chlorine has three shells and is in period 3 ✓ Number of electrons in outer shell is the same as the group number / sodium is in group 1 and has 1 electron in the outer shell / chlorine is in Group 7 and has 7 electrons in the outer shell ✓	2	2.1	**ALLOW** shows/determines for 'is the same' as long as 'number' or 'how many' is stated somewhere in the answer. **DO NOT ALLOW** sodium has two shells and is in period 2 **IGNORE** references to losing/gaining electrons **DO NOT ALLOW** if statement for chlorine or sodium is incorrect
	(c)		Protons = 11 ✓ Neutrons = 12 ✓ Electrons = 11 ✓	2	2.2	3 correct = 2 marks 2 or 1 correct = 1 mark

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