Smart Edge!
More Than Knowledge

OCR · GCSE CHEMISTRY J248

Foundation Tier — Paper 2

June 2024 exam series

MARK SCHEME

Foundation

GCSE

Chemistry A (Gateway Science)

J248/02: Paper 2 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

Oxford Cambridge and RSA Examinations

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. **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(c)**.

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

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

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 A:

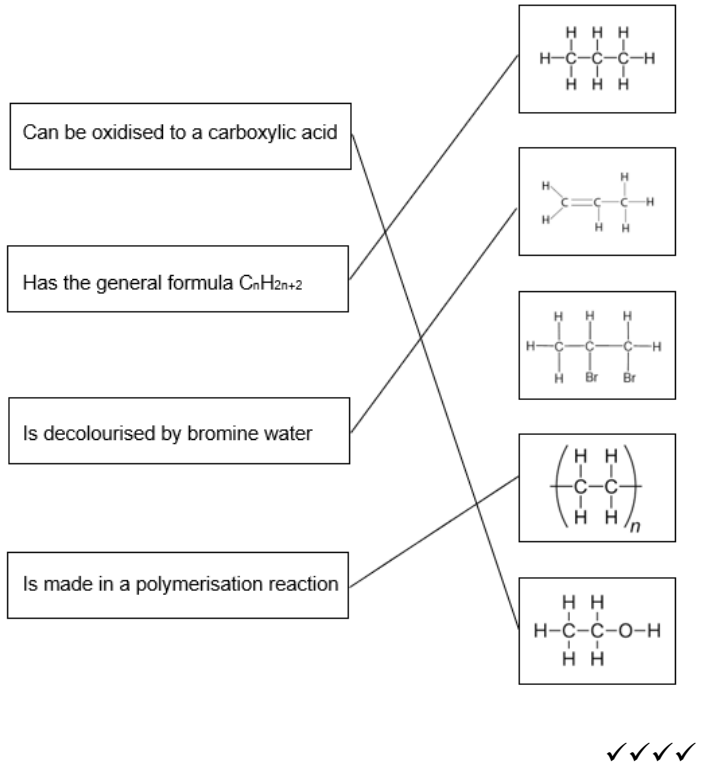
	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge 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	C ✓	1	1.2	
2	A ✓	1	1.2	
3	C ✓	1	1.2	
4	B ✓	1	1.1	
5	C ✓	1	1.1	
6	D ✓	1	1.1	
7	C ✓	1	2.1	
8	B ✓	1	1.1	
9	C ✓	1	2.2	
10	D ✓	1	2.2	
11	C ✓	1	2.1	
12	B ✓	1	2.1	
13	A ✓	1	2.1	
14	C ✓	1	2.1	
15	C ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
16	(a)		Ethane ✓	1	1.1	
	(b)		$CH_4 + 2\ \mathbf{O_2} \rightarrow CO_2 + \mathbf{2}\ H_2O$ ✓ ✓	2	2 x 2.1	
	(c)		Poisonous / toxic ✓	1	1.1	**ALLOW** an effect of CO, e.g., can cause difficulty breathing or suffocation / attaches to the haemoglobin (protein) in red blood cells / reduces the amount of oxygen that the blood can carry / can cause death ✓ **IGNORE** harmful / dangerous / causes drowsiness/ causes headaches **IGNORE** contributes to global warming / greenhouse effect

Question			Answer	Marks	AO element	Guidance
16	(d)		boiling point(s) ✓ stronger ✓ energy ✓	3	3 x 1.1	**ALLOW** size / mass / intermolecular force **ALLOW** more/higher/ larger/ strong or **AW** **IGNORE** many/ lots of **ALLOW** heat **IGNORE** force
	(e)		Cracking ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
16	(f)		 ✓✓✓✓	4	4 x 2.1	Mark each left-hand box Each box may only have one line

Question			Answer	Marks	AO element	Guidance
17	(a)		**Any two from:** Idea that tube 1 contains water / there was no water in test tube 2 / water is needed for rusting ✓ Idea that tube 1 contains air / there was no air in test tube 3 / air is needed for rusting ✓	**2**	**2 x 3.2b**	
	(b)		The nail does not rust ✓ (Idea that paint acts as a) barrier to air and/or water ✓	**2**	**3.2b** **2.2**	'attack / reaction / oxidation' = rusting **ALLOW** 'painting prevents rusting' for the no rusting mark **IGNORE** paint is a barrier / protects nail. We need what it's being protected from **ALLOW** correct detail but calling it galvanising
	(c)	**(i)**	**Material** – Metal ✓ **Explanation** (Metal) has **the highest** thermal conductivity ✓ Idea that metal has a **suitable** / **high** melting point ✓	**3**	**3 x 3.2a**	 **IGNORE** 'it conducts heat' / it conducts heat well' **ALLOW** it conducts most heat **DO NOT ALLOW** it has the highest mpt **IGNORE** arguments about strength / bpt of pan material
		(ii)	(2000 ÷ 200 =) 10 ✓	**1**	**3.1a**	**IGNORE** 10.8, 11
	(d)		Recycling aluminium saves the **most** CO_2 per year ✓ Idea that recycling aluminium saves a reasonable amount of energy ✓	**2**	**2 x 3.1b**	**IGNORE '**saves 294kg CO_2 a year' / most beneficial to environment **ALLOW** releases least CO_2 into the environment **ALLOW** saves 4 hours energy without comparator **IGNORE** Al powers TVs

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>18</td><td>(a)</td><td></td><td>(F) A D (C) E B ✓✓✓</td><td>3</td><td>3 x 1.1</td><td>All 4 correct = 3 marks
2 correct = 2 marks
1 correct = 1 mark</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Nitrogen ✓

Oxygen ✓</td><td>2</td><td>2 x 1.1</td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>Potable (water) ✓</td><td>1</td><td>1.1</td><td>DO NOT ALLOW portable (water)</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Kills bacteria / kills microorganisms ✓</td><td>1</td><td>1.1</td><td>IGNORE kills germs / cleans water

Attacking/neutralising bacteria = BOD
IGNORE gets rid of bacteria</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Damp (blue) litmus paper ✓

(Turns red then) is bleached ✓</td><td>2</td><td>2 x 1.2</td><td>Bleaches universal indicator = 1 for the bleach mark</td></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td><table><tr><th></th><th>Decreases</th><th>Increases</th><th>Stays the same</th></tr><tr><td>When the amount of sulfur dioxide increases the pH of rainwater...</td><td>✓</td><td></td><td></td></tr><tr><td>Rainwater is more acidic when the pH...</td><td>✓</td><td></td><td></td></tr><tr><td>When the rainwater is more acidic the amount of acid rain...</td><td></td><td>✓</td><td></td></tr></table></td><td>3</td><td>3 x 3.1a</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Erosion of stonework /
corrosion of metals /
kills trees or kills living things in rivers or lakes ✓</td><td>1</td><td>1.1</td><td>ALLOW causes breathing difficulties (asthma)
IGNORE references to pollution / global warming

ALLOW attacks / damages / deforms statues / stonework
IGNORE rocks
ALLOW brick</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
19	(a)		Burette ✓	1	1.2	**ALLOW** range of spelling
	(b)		Idea of making it easier to see precisely when the indicator changes colour ✓	1	1.2	Must have idea of colour and idea of change **ALLOW** to know when it turns clear **IGNORE** idea of improving measuring volumes of solution
	(c)		Idea of (more) accurate/precise end point / Idea of speed of change / Easier to stop excess alkali being added (when the indicator changes colour) ✓	1	1.2	**ALLOW** to make it more accurate **ALLOW** to see at what point the colour changed **IGNORE** So they can calculate how many drops added to make it change **ALLOW** If too much added, titration ruined
	(d)		$HCl + NaOH \rightarrow NaCl + H_2O$ Correct formula for $NaCl$ ✓ Rest of equation correct ✓	2	2 x 2.1	**ALLOW** any correct multiple, including fractions **DO NOT ALLOW** and / & instead of '+' Equation mark is dependent on a correct NaCl
	(e)		**First check the answer on the answer line** **If answer = 11.6 (g) award 4 marks** M_r of H_2SO_4 = 98.1 **AND** K_2SO_4 = 174.3 ✓ Substitution into Mass of K_2SO_4 = 6.54 x $\frac{174.3}{98.1}$ ✓ = 11.62 ✓ To 3 significant figures = 11.6 (g) ✓	4	3 x 2.2 1 x 1.2	**ALLOW ECF** from incorrect M_r **ALLOW ECF** on answer **ALLOW ECF** for sig fig mark from calculations involving identifiable multiplication or division

Question			Answer	Marks	AO element	Guidance
20	(a)		Balance ☐ Beaker ☐ Gas syringe ✓ Pipette ☐	1	2.2	
	(b)	(i)	Linear scale on y-axis so all points can be plotted, with axis numbered ✓ All points plotted correctly scores 2 marks ✓✓	3	3 x 2.2	**IGNORE** poor choice of axis scale as it is likely to cause problems with the point plotting as well **ALLOW** ± ½ square 3 or 4 points plotted correctly scores 1 mark
		(ii)	Curve of best fit through all the points ✓	1	1.2	**IGNORE** downturn **after** 270 sec, not before **ALLOW** line to miss an occasional point by a square or so. If 2 squares out, should be a clear reason. **DO NOT ALLOW** a bit of double line **DO NOT ALLOW** straight line dot-to-dot except first interval
		(iii)	240 (s) ✓	1	2.2	**ALLOW** ECF
		(iv)	Idea that all the (dilute hydrochloric) acid was used up / (dilute hydrochloric) acid was the limiting reactant ✓	1	2.2	**ALLOW** the reactants are used up, not 'may be' **IGNORE** 'Too many marble chips for the acid to dissolve'/ 'The acid stops giving off CO_2' / 'The marble is used up'

Question			Answer	Marks	AO element	Guidance
20	(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)** Analyses the results to conclude that experiment 2 has the faster rate of reaction and suggests how the experiment could be improved. **AND** Applies knowledge and understanding to give a detailed explanation why experiment 2 is faster. *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)** Analyses the results to conclude that experiment 2 has the faster rate of reaction. **AND** Suggests how the experiment could be improved **OR** applies knowledge and understanding to attempt to explain why experiment 2 is faster. *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)** Analyses the results to conclude that experiment 2 has the faster rate of reaction **OR** Suggests how the experiment could be improved **OR** Applies knowledge and understanding to attempt to explain why experiment 2 is faster. *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 2.2** **2 x 3.2b** **2 x 3.3b**	**AO3.2b Analyses information to draw conclusions** • The data shows that experiment 1 is 9 times slower than experiment 2. • The data shows that experiment 2 has a faster **rate** because the reaction **time** is shorter. **AO2.2 Applies knowledge & understanding to explain results** • Experiment 2 is faster because the magnesium is in smaller pieces (than experiment 1). • Smaller pieces have a larger surface area so there is a higher collision frequency, and the reaction is faster. • Experiment 2 is faster because the temperature of the acid is higher (than experiment 1). • Higher temperature means that the particles move faster / have more energy. • There is a higher frequency of (successful) collisions, and the reaction is faster. **AO3.3b Analyses information to improve experimental procedures** • The experiment could be improved by only changing one variable (size of magnesium / temperature of acid) at a time • But the data shows that experiment 2 is faster than experiment 1. **IGNORE** use a stopwatch

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	Melting point decreases (down the group) / Boiling point decreases (down the group) ✓	1	3.1a	**ALLOW ORA** **Assume unqualified answers refer to down the group** **IGNORE** references to density
		(ii)	Answer in range 35 – 10 (°C) ✓	1	3.2a	
	(b)	(i)	(Group 1 elements) all have 1 electron in the <u>outer</u> or <u>valence</u> shell / Idea that (Group 1 elements) all want to lose 1 electron to get a full or complete (outer) shell ✓	1	1.1	**ALLOW** (Group 1 elements) all have the same number of electrons in the <u>outer</u> or <u>valence</u> shell **ALLOW** idea that (Group 1 elements) all want to lose 1 electron to become stable
		(ii)	(Down the group) <u>outer</u> shell electron is further from the nucleus ✓ Less attraction between nucleus and <u>outer</u> shell electron / more shielding ✓ <u>Outer</u> electron is lost more easily ✓	3	3 x 1.1	**Reference to <u>outer</u> shell electron must be made at least once to award 3 marks** **Mark independently** **ALLOW** valence electron for outer shell electron **ALLOW** (Down the group) the atomic radius is larger / more (electron) shells (down the group) **DO NOT ALLOW** references to <u>intermolecular</u> forces **ALLOW** electrons in plural **IGNORE** <u>outer</u> electron is lost more quickly
		(iii)	$2Na + Br_2 \rightarrow 2NaBr$ Formulae ✓ Balancing ✓	2	2 x 2.1	**ALLOW** any correct multiple, including fractions **ALLOW** = for $\rightarrow$ **DO NOT ALLOW** and / & instead of '+' **IGNORE** state symbols Balancing mark is dependent on the correct formulae but **ALLOW** 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. 2NA + Br2 $\rightarrow$ 2NaBr

Question			Answer	Marks	AO element	Guidance
	(c)		Any two from: They used hydrochloric acid ✓ (Hydrochloric acid) contains chloride ions ✓ Idea that experiment will give a positive result (for chloride ions) ✓ Nitric acid should have been used (instead of hydrochloric acid) ✓	**2**	**2 x 2.2**	**IGNORE** chlorine ions **ALLOW** (hydrochloric acid) contains chlorine

Question			Answer	Marks	AO element	Guidance
22	(a)	(i)	⇌ sign (in equation) ✓	1	1.1	**ALLOW** a description of the ⇌, e.g., the double arrow / the arrow pointing both ways / equilibrium symbol **IGNORE** just 'the reversible symbol' / the symbol in the middle **BUT ALLOW** 'the reversible arrow'
		(ii)	Idea of no loss or gain of reactants and products ✓	1	1.1	**ALLOW** 'substance(s)' for reactants / products **ALLOW** idea that that nothing can get in or out / a description of a closed system, e.g., a flask with a bung in **IGNORE** just no gas can escape
		(iii)	Only ammonia, NH_3, is being made. ☐ The amounts of reactants and products are constant. ☑ The forward and backward reactions are happening at the same rate. ☑ The forward reaction is faster than the backward reaction. ☐ The reaction has finished. ☐ ✓✓	2	2 x 1.1	
	(b)		(Change) temperature ✓	1	2.1	**ALLOW** increase or decrease **ALLOW** add more products / ammonia **IGNORE** concentration

	(c)		**First check the answer on the answer line** **If answer = 77.5 or 78 (%) award 2 marks** Percentage yield = $\frac{620}{800}$ x 100 ✓ = 77.5 or 78 (%) ✓	**2**	**2 x 2.1**	**ALLOW ECF** **ALLOW** % yield = (am ÷ pm) x 100 for 1 mark if no other mark awarded
	(d)		Idea that there is only one product / only ammonia is made ✓	**1**	**2.1**	**ALLOW** no waste product(s) or byproducts are made / all the products are useful **IGNORE** no atoms lost / idea that everything is used / nothing is wasted / idea that mass of reactants equals mass of product(s)

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