Foundation

GCSE

Chemistry A (Gateway Science)

J248/01: Paper 1 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2025

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 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 question on this paper is **Question 18.**

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	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.

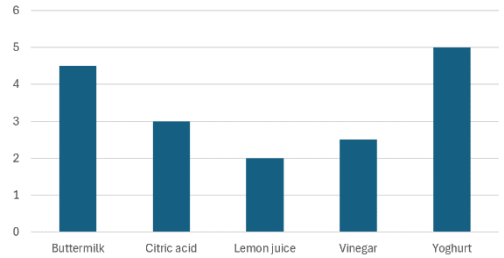
The breakdown of Assessment Objectives for GCSE (9-1) in Chemistry A:

	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.

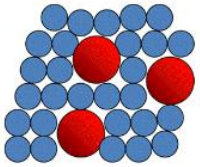
For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	B ✓	1	2.1	
2	A ✓	1	1.1	
3	A ✓	1	1.1	
4	D ✓	1	2.1	
5	D ✓	1	1.1	
6	C ✓	1	1.1	
7	B ✓	1	2.1	
8	A ✓	1	2.1	
9	B ✓	1	2.2	
10	A ✓	1	1.1	
11	A ✓	1	2.2	
12	A ✓	1	2.1	
13	B ✓	1	2.1	
14	B ✓	1	1.1	
15	B ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	I ✓	1	2.1	
		(ii)	D / F /G ✓	1	2.1	
		(iii)	H ✓	1	2.1	
		(iv)	E / H / I ✓	1	2.1	
		(v)	G / H ✓	1	2.1	
	(b)		D **and** F ✓	1	2.1	Both required for the mark

Question			Answer	Marks	AO element	Guidance
17	(a)		Alkalis ✓ Gas ✓ Carbon dioxide ✓ Neutralisation ✓	4	4 × 1.1	
	(b)	(i)	Add universal indicator ✓ Idea of matching colour with pH chart ✓	2	2 × 3.3a	**ALLOW** pH paper / pH liquid **DO NOT ALLOW** litmus **ALLOW** use of pH probe / pH meter ✓ pH given as a number/reading ✓
		(ii)	Lemon juice ✓	1	3.2b	
		(ii)		2	2 × 1.2	1 mark for each bar correct **ALLOW** ± ½ small square
	(c)		**First check the answer on the answer line** **If answer = 192 award 2 marks** (6 x 12) + (8 x 1) + (7 x 16) ✓ = 192 ✓	2	2 × 2.1	**ALLOW ECF**

Question			Answer	Marks	AO element	Guidance
18			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)** Applies knowledge and understanding to describe in detail a method to obtain pure samples of iron filings, sand and salt. *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)** Applies knowledge and understanding to attempt to describe a method to obtain samples of iron filings, sand and salt and pure samples of any two. *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)** Applies knowledge and understanding to describe a method to obtain a pure sample of one of iron filings or sand or salt from the mixture. *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 × 2.2** **4 × 3.3a**	**AO3.3a Analyses information and ideas to develop experimental procedures** • Use a magnet to remove iron from the mixture. • Add water to mixture of sand and salt. • Filter the water, sand, salt mixture. • Sand is left on filter paper. • Place filter paper in warm oven to dry. • Heat salt water until it begins to crystallise. • Leave to cool and dry on windowsill / warm oven. **AO2.2 Applies knowledge and understanding of scientific enquiry, techniques and procedures.** • Iron is magnetic. • Salt is soluble so will dissolve in water. • Sand is insoluble so will not dissolve in water.

Question			Answer	Marks	AO element	Guidance
19	(a)		Metal **C** ✓ **And any two from:** (It has a very high resistance to corrosion) so will last longer ✓ (It has a low density) so is more fuel efficient / can carry more load ✓ (It is strong) so not damaged during flight ✓	3	**1 × 3.2a** **2 × 2.1**	**ALLOW** is able to fly **ALLOW** has to carry (many) pasengers / has to carry a heavy load
	(b)	**(i)**	 Particles in alloys different sizes ✓ Layers in alloy disrupted/cannot slide ✓	**2**	**2 × 2.1**	**ALLOW** marks from labelled diagram **IGNORE** elements are different sizes **IGNORE** particles cannot slide

Question			Answer	Marks	AO element	Guidance
		(ii)	**First check the answer on the answer line** **If answer = 2.15 (%) award 4 marks** Total mass = 0.17 + 7.73 = 7.90 (g) ✓ Percentage of carbon = $\frac{0.17}{7.90}$ x 100 ✓ = 2.15189873 ✓ **3 significant figures:** = 2.15 ✓	**4**	**3 × 2.2** **1 × 1.2**	**ALLOW ECF** from incorrect total mass **ALLOW ECF** for significant figure mark

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>20</td><td>(a)</td><td></td><td>
<table>
<tr><td>Sub-Atomic Particle</td><td>Mass</td><td>Charge</td></tr>
<tr><td>Electron</td><td>0.0005 / $\frac{1}{2000}$</td><td>-1 / 1-</td></tr>
<tr><td>Neutron</td><td>1</td><td>0 / neutral / no charge</td></tr>
<tr><td>Proton</td><td>1</td><td>+1</td></tr>
</table>
✓✓✓</td><td>3</td><td>3 × 1.1</td><td>All four correct = 3 marks
Three correct = 2 marks
One or two correct = 1 mark

ALLOW mass of electron as almost 0 / negligible/ any quoted value which is negligible (≤ 0.00056)
BUT DO NOT ALLOW mass as 0 / nothing

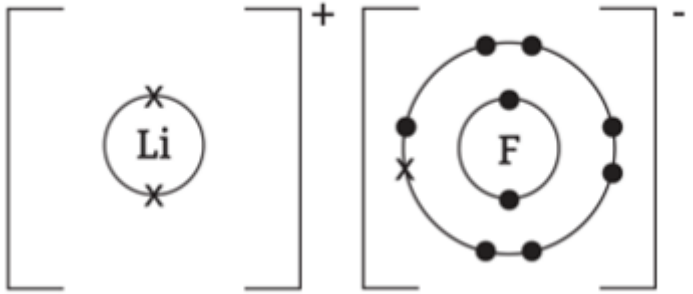
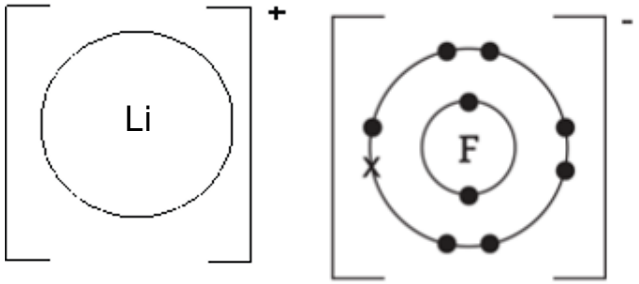
DO NOT ALLOW just '–' for charge on electron</td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><td></td><td>True</td><td>False</td></tr>
<tr><td>Lithium has 3 electrons</td><td>✓</td><td></td></tr>
<tr><td>Lithium has 3 neutrons</td><td></td><td>✓</td></tr>
<tr><td>Lithium has 4 protons</td><td></td><td>✓</td></tr>
</table>
✓✓</td><td>2</td><td>2 × 2.1</td><td>All three correct = 2 marks
One or two correct = 1 mark</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Loses ✓

Positive ✓</td><td>2</td><td>2 × 1.1</td><td></td></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td>Element ✓

Protons ✓

Neutrons ✓</td><td>3</td><td>3 × 1.1</td><td>IGNORE electrons</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>$^{6}_{3}Li$ ✓

Mass number 7 ✓</td><td>2</td><td>2 x 1.1</td><td></td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
	(e)		 **OR**  Correct lithium ion ✓ Correct fluoride ion ✓	**2**	**2 x 2.1**	Two correct electronic structures but no charges/incorrect charges award one mark Two correct charges with incorrect electronic structure award one mark The ionic charges must **not** be shown in the nucleus **ALLOW** answers showing the transfer of electrons providing the same electrons are not shown twice **ALLOW** electrons as all dots or all crosses or a mix of both Inner shell electrons do not need to be shown but must be correct if they are shown

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>21</td><td>(a)</td><td>(i)</td><td>Measure (an appropriate volume of) copper sulfate solution (in a measuring cylinder and put) into beaker ✓

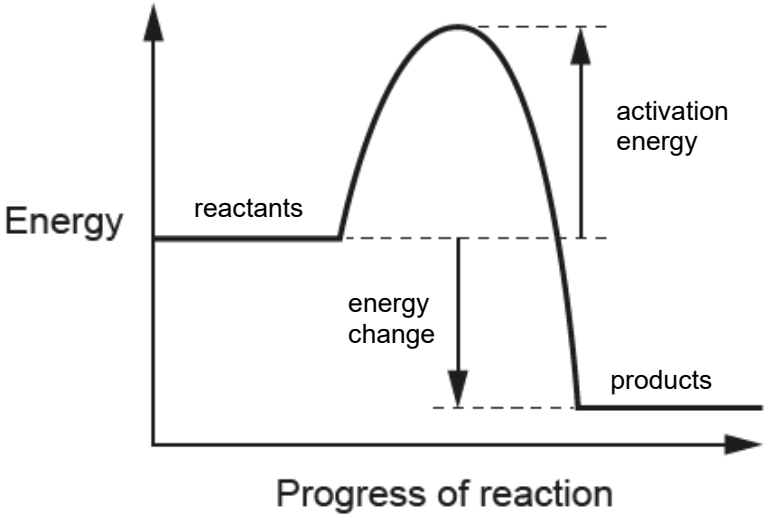
Record temperature of the copper sulphate ✓

Add (magnesium) powder ✓
(Stir and) record maximum/minimum/end/final temperature ✓</td><td>4</td><td>4 x 3.3a</td><td>

DO NOT ALLOW temperature of the mixture as the initial temperature

IGNORE measure temperature change</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><th>Experiment</th><th>Endothermic</th><th>Exothermic</th></tr><tr><td>1</td><td></td><td>✓</td></tr><tr><td>2</td><td>✓</td><td></td></tr><tr><td>3</td><td></td><td>✓</td></tr></table>✓</td><td>1</td><td>1.2</td><td>All three needed for the mark</td></tr>
</table>

Question	Answer	Marks	AO element	Guidance
(b)	Use a polystyrene cup ✓ Idea of insulating (the mixture) ✓ OR Put a lid on the beaker ✓ Idea of insulating (the mixture) ✓	2	1 x 3.3b 1 x 2.2	One mark for improvement and one mark for explanation Explanation must be linked to score both marks **ALLOW** to reduce heat released to the surroundings **ALLOW** to reduce heat released to the surroundings **ALLOW** insulate the beaker to reduce heat released to the surroundings **IGNORE** thermometers / mass of magnesium

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	 Reactants and products ✓ Activation energy ✓ Energy change ✓	3	3 x 1.2	
		(ii)	(Exothermic) (no mark) As reactants have more energy than products / ORA✓	1	2.2	**Mark is for explanation** **DO NOT ALLOW endothermic** **ALLOW** energy is given out / energy is released **IGNORE** graph ends lower than it starts

Question			Answer	Marks	AO element	Guidance
22	(a)		A and C ✓ Nanoparticles are between 1-100 (nm) ✓	2	1 x 3.2b 1 x 1.1	**Mark independently** **ALLOW** 97 and 11 **IGNORE** idea that B is too large and D is too small **IGNORE** they are very small / these are the smallest
	(b)	(i)	Sunscreens / cosmetics ✓ Because it blocks UV light / cannot be seen on the skin ✓ **OR** Self-cleaning windows ✓ They catalyse the breakdown of dirt ✓ **OR** Clothing ✓ Nanoparticles of silver provide antibacterial properties ✓ **OR** Catalysts ✓ Idea that they have a high surface area to volume ratio (so can speed up reactions) ✓ **OR** Lubricants ✓ Idea that individual sheets (of graphene) can slide relative to each other ✓ **OR** Electric/electronic circuits ✓ Idea that nanoparticles make the device smaller / idea that nanoparticles are <u>better</u> conductors ✓ **OR** Sports equipment ✓ Idea that nanoparticles (eg graphene) improve strength / are lightweight / have better power transfer ✓	2	2 x 1.1	**Explanation must match the use given** **ALLOW** named example, eg tennis racket, golf clubs etc **ALLOW** any suitable use and correct explanation

Question			Answer	Marks	AO element	Guidance
		(ii)	They can block ultraviolet light. ☐ They can catalyse harmful reactions in the body. ✓ They can have antibacterial properties. ☐ They can have toxic effects on the body. ✓ They have a high surface area to volume ratio. ☐ ✓✓	2	2 x 1.1	
	(c)		**First check the answer on the answer line** **If answer = 0.6 or 0.6:1 or 1:1.7 award 3 marks** Surface area = $6 \times 10^2 = 600$ ✓ Volume = $10^3 = 1000$ ✓ Surface area ÷ volume ratio = 600 ÷ 1000 = 0.6 or 0.6:1 or 1:1.7 ✓	3	2 x 2.2 1.2	**Units not needed** **ALLOW** ECF from incorrect surface area and/or volume **ALLOW** 1 : 1.6666667 **ALLOW** 3:5 / 6:10 or any ratio consistent with 0.6:1 **ALLOW** ratio given as a fraction eg $\frac{3}{5}$, $\frac{600}{1000}$ **DO NOT ALLOW** ratio wrong way round eg 1:0.6

Question			Answer	Marks	AO element	Guidance
23	(a)		A substance that contains only one (type of) atom or element or compound or molecule or particle ✓	1	1.1	**IGNORE** idea that pure substances have a fixed m.pt rather than a range of m.pts. **IGNORE** idea of only one substance
	(b)	(i)	**Any two from:** Start line drawn in pencil ✓ Idea of solvent below the start line ✓ Dots drawn further apart ✓	2	2 x 3.3b	 **ALLOW** idea that dye (spots) must be above the solvent **ALLOW** water for solvent **IGNORE** add a lid (to stop the solvent evaporating)
		(ii)	Pink ✓ Idea that R_f value is in the range (0.40-0.80) ✓	2	2 x 3.2b	

Question			Answer	Marks	AO element	Guidance
	(c)		**First check the answer on the answer line** **If answer = 0.79 award 2 marks** R_f value = 2.7 ÷ 3.4 ✓ = 0.79 ✓	**2**	 **1.2** **2.2**	 **DO NOT ALLOW** 3.4 ÷ 2.7 **ALLOW 0.8** or any correctly rounded value from 0.7941176471 **ALLOW** 0.80
	(d)		**First check the answer on the answer line** **If answer = 7.89 / 7.9 award 2 marks** $\frac{5.1}{9.7}$ = 0.5257732 ✓ 0.5257732 x 15 = 7.88659794 ✓ **OR** $\frac{15.0}{9.7}$ = 1.5463917 ✓ 1.5463917 x 5.1 = 7.88659794 ✓	**2**	**2 x 2.2**	**ALLOW** any correctly rounded value **ALLOW** $\frac{5.1}{9.7}$ = 0.53 0.53 x 15 = 7.95, provided working out is shown **ALLOW ECF** from MP1 **ALLOW** $\frac{15.0}{9.7}$ = 1.55 1.55 x 5.1 = 7.91, provided working out is shown **ALLOW ECF** from MP1

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