OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

Twenty First Century Science Suite

General Certificate of Secondary Education **J634**

Mark Scheme for the Units

January 2010

J634/MS/R/10J

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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CONTENTS

GCSE Twenty First Century Chemistry A (J634)

MARK SCHEMES FOR THE UNITS

Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

   / = alternative and acceptable answers for the same marking point
   (1) = separates marking points
   not/reject = answers which are not worthy of credit
   ignore = statements which are irrelevant - applies to neutral answers
   allow/accept = answers that can be accepted
   (words) = words which are not essential to gain credit
   words = underlined words must be present in answer to score a mark
   ecf = error carried forward
   AW/owtte = alternative wording
   ORA = or reverse argument

   Eg mark scheme shows 'work done in lifting/(change in) gravitational potential energy' (1)
   work done = 0 marks
   work done lifting = 1 mark
   change in potential energy = 0 marks
   gravitational potential energy = 1 mark

5. Annotations:
   The following annotations are available on SCORIS.

   ✓ = correct response
   ✗ = incorrect response
   bod = benefit of the doubt
   nbod = benefit of the doubt **not** given
   ECF = error carried forward
   ^ = information omitted
   I = ignore
   R = reject

6. If a candidate alters his/her response, examiners should accept the alteration.
7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Eg
For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	☒
☐	☐	☒
✓	☒	✓
☒	☒	✓
☐	☐	☐
This would be worth 0 marks.	This would be worth one mark.	This would be worth one mark.

8. The list principle:
   If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

   Always check the additional guidance.

   If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
   If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.
   Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick.
   Candidates cannot score less than zero marks.

   Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

A321/01 Modules C1, C2, C3 Foundation Tier

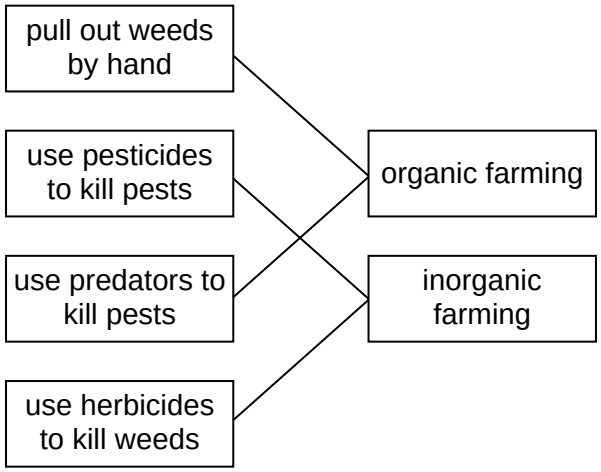
Question			Expected Answers	Marks	Additional Guidance
1	a	i	E (1)	[1]	
		ii	B (1)	[1]	
		iii	A (1)	[1]	
		iv	F (1)	[1]	
	b	i	from the exhaust of car engines ☐ ✓ (1) from oil-burning power stations ☐ ✓ (1)	[2]	
		ii	**any two from:** nitrogen dioxide dissolves in water; reacts with oxygen; forms acid rain; **plus** effect of acid rain eg erodes buildings / kills fish / kills trees (1)	[3]	**ignore** references to global warming **allow** makes lakes acidic **allow** harms/damages trees/fish **allow** damages/corrodes buildings do **not** allow burns buildings **ignore** references to asthma etc
			Total	[9]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>2</td><td>a</td><td></td><td>as the number of vehicles increases the number of particulates increases /
there is a <u>positive</u> correlation (between number of vehicles and particulate concentration) (1)</td><td>[1]</td><td>allow reverse answer – decreases and decreases
allow alternatives for increases eg goes up and for decreases eg goes down</td></tr>
<tr><td></td><td>b</td><td>i</td><td>A pattern in the results … ☑ (1)
☐
☐
☐
… other explanations … ☑ (1)</td><td>[2]</td><td></td></tr>
<tr><td></td><td></td><td>ii</td><td><table><tr><th></th><th>likely</th><th>not likely</th></tr><tr><td>The direction of the wind.</td><td>✓</td><td></td></tr><tr><td>How close to the motorway the …</td><td>✓</td><td></td></tr><tr><td>Whether the sun is shining.</td><td></td><td>✓</td></tr><tr><td>The number of cars passing by.</td><td>✓</td><td></td></tr></table></td><td>[2]</td><td>four correct = 2 marks
three or two correct = 1 mark
one correct = 0 marks</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[5]</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
3	a		☐ The range of the results ... ✓ (1) ☐ ☐	[1]	
	b	i	sample 2 (1)	[1]	**accept** 11
		ii	☐ ☐ The result is very different … ✓ (1) ☐	[1]	
	c		23 (1)	[1]	
	d	i	☐ ☐ ☐ It forms strong bonds … ✓ (1)	[1]	

Question			Expected Answers	Marks	Additional Guidance
3	d	ii	☐ ☐ It increases the length … ☑ (1) ☐	[1]	
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	… make the material. ✓ … make bags from the material. ✓ ☐ ☐ … disposing of the bags. ✓	[2]	all three correct = 2 marks two correct = 1 mark one correct = no marks
		ii	Plastic decomposes very slowly. ✓ (1) ☐ ☐ Paper is attacked by bacteria … ✓ (1) ☐	[2]	
		iii	cheaper / stronger (1)	[1]	comparison required eg **allow** stronger not strong **allow** rip more easily
	b		landfill will take longer to fill up (1) less litter around the countryside (1) less harm to wildlife (1)	[3]	**allow** one answer relating to not using up so much crude oil
			Total	[8]	

Question			Expected Answers	Marks	Additional Guidance
5	a			[3]	all four correct = 3 marks three correct = 2 marks two correct = 1 mark one correct = 0 marks two lines to or from a box on the left means that neither of the two lines can be counted as correct
	b	i	a plan for meeting people's needs (1) without spoiling the environment for the future / leaving resources for the future (generations) (1)	[2]	**allow** without using up finite resources **allow** replacing what we use so that it does not run out in the future for **2 marks** **allow** examples in place of resources eg trees
		ii	**any two from:** organic farming uses natural fertilisers eg manure (that can be obtained from animals); organic farming uses natural predators (to kill pests); organic farming does not use up (finite) crude oil supplies;	[2]	**allow** supply of animal manure will not run out ora intensive farming uses synthetic pesticides/ chemicals ora fossil fuels used to make eg synthetic fertiliser/chemicals will run out
			Total	[7]	

Question			Expected Answers	Marks	Additional Guidance
6	a		... a longer shelf life. ✓ (1)	[1]	
	b	i	true / false ... independent ... ... watchdog. ✓ / ☐ ... funded by ... ☐ / ✓ ... protects the public's health ... ✓ / ☐ ... an Act of Parliament. ✓ / ☐	[2]	all four correct = 2 marks three correct = 1 marks two correct or one correct = 0 marks
		ii	...has passed a safety test. ✓ (1) ...approved for use in the EU. ✓ (1)	[2]	

Question			Expected Answers	Marks	Additional Guidance
6	c		☐ ☐ ... lower ... ... than some food. ✓ (1) ☐ ... maximum recommended dose … ✓ (1)	[2]	
			Total	[7]	

A321/02 Modules C1, C2, C3 Higher Tier

Question			Expected Answers	Marks	Additional Guidance
1	a	i	… N_2 from air … … O_2 from air … ✓ (1) … monoxide reacts with O_2 … ✓ (1)	[2]	
		ii	**any two from:** nitrogen dioxide dissolves in water; reacts with oxygen; forms acid rain; **plus** effect of acid rain eg erodes buildings / kills fish / kills trees (1)	[3]	**ignore** references to global warming **allow** makes lakes acidic **allow** harms/damages trees/fish **allow** damages/corrodes buildings do **not** allow burns buildings **ignore** references to asthma etc

Question			Expected Answers	Marks	Additional Guidance
1	a	iii	Carbon monoxide is converted … ✓ (1) Nitrogen monoxide is decomposed … ✓ (1)	[2]	
1	b		[ ] 11 [ ] 8	[2]	
			Total	[9]	

Question			Expected Answers	Marks	Additional Guidance
2	a		as the number of vehicles increases the number of particulates increases / there is a <u>positive</u> correlation (between number of vehicles and particulate concentration) (1)	[1]	**allow** reverse answer – decreases and decreases **allow** alternatives for increases eg goes up and for decreases eg goes down
	b	i	… report similar results … ☐ ✓ (1) … produces a smoky flame. ☐ ✓ (1)	[2]	
		ii	… powered by electric motors. ☐ ✓ (1) … removed from the flue … ☐ ✓ (1)	[2]	
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
3	a		… 26 kN is not in the range … ✓ (1) … 23 kN is not in the range … ✓ (1)	[2]	
	b		so that the outcome is only affected by the factor being investigated / so that other factors do not change the results (1) because change in temperature/equipment could affect the results (1)	[2]	**ignore** references to fair testing / accuracy of results / reliability **allow** explanation of effect of temperature/equipment eg at higher temperature will be softer
	c	i	… strong bonds … ✓ (1)	[1]	

Question			Expected Answers	Marks	Additional Guidance
3	c	ii	It increases the length … ✓ (1)	[1]	
			Total	[6]	

4	a		The energy used to make the material. ✓ The energy used to make bags. ✓ … disposing of the bags. ✓	[2]	all three correct = 2 marks two correct = 1 mark one correct = no marks
	b		**any three from:** people have become more aware of environmental issues / people are more aware that the plastic bags are not biodegradable (1) we produce more rubbish now (1) oil reserves are smaller now / material to make bags is running out (1) there is now not much space left for landfill (1)	[3]	**ignore** references to paper bags answers must refer to attitudes and fit a time line eg then and now **ignore** vague references to global warming / pollution / litter / biodegradability / scientific research about biodegradability **allow** a mark for carbon dioxide given off as fuel is burned to make plastic bags is now known to cause global warming

Question			Expected Answers	Marks	Additional Guidance
4	c		… used for longer … ✓ (1) There is less poly(ethene) … ✓ (1) … more likely to be dropped … ✓ (1)	[3]	
			Total	[8]	

5	a		… population … … much larger … ✓ (1) … produce higher yields … ✓ (1)	[2]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>5</td><td>b</td><td></td><td>
<table>
<tr><td>✓</td><td>...more sustainable</td><td rowspan="4">but</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>…sufficient fertiliser.</td><td>✓</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>
</td><td>[2]</td><td></td></tr>
<tr><td></td><td>c</td><td></td><td>☐
☐
… damage to the environment. ✓ (1)
… toxic pesticide residues. ✓ (1)
☐
☐</td><td>[2]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[6]</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
6	a		… has passed a safety test. ☐ ✓ (1) … approved for use in the EU. ☐ ✓ (1)	[2]	
	b		Soft drinks contain much lower … ☐ ✓ (1) You would have to drink about … ☐ ✓ (1)	[2]	
	c	i	what is the **chance/risk** that they will be harmed by sodium benzoate (1) how serious would the harm caused by sodium benzoate be / what damage it may cause (1)	[2]	answers must be based on chance and consequence **ignore** risk and benefit answers **allow** the same ideas expressed with different wording **allow** what dosage would cause harm **and** how much is in the drinks **and** how much you drink (all three ideas for one mark) **ignore** vague references to effect on the body, amount in drinks or how much causes harm

Question			Expected Answers	Marks	Additional Guidance
6	c	ii	for actions where the risk is not known for certain / we do not know for certain if it is harmful (1) it is better to avoid the risk / it is better to avoid it until we do know (1)	[2]	**allow** one mark for 'it is better to be safe than sorry' if neither of the other two marking points have scored ignore 'don't want to take the risk' unless qualified ignore references to allergies ignore risk and benefit answers
			Total	[8]	

A322/01 Modules C4, C5, C6 Foundation Tier

Question			Expected Answers	Marks	Additional Guidance
1	a		group and period (1)	[1]	
	b		2 and 20 (1)	[1]	**allow** 'alkali Earth metals' instead of 2
	c	i	magnesium (1)	[1]	
		ii	carbon (1)	[1]	
			Total	[4]	

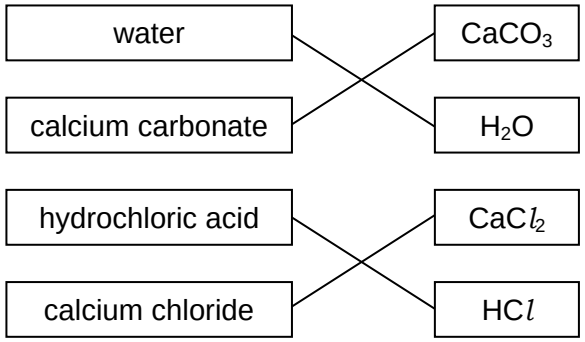
2	a		**any two from:** properties show a trend/pattern / example of pattern eg melting point/density changes as go down group (1) melting point is between sodium and rubidium / melting point between 39°C and 98°C (1) density is between sodium and rubidium / density between 1.53 g/cm^3 and 0.97 g/cm^3 (1)	[2]	**ignore** references to atomic number /reactivity **allow** value between 39°C and 98°C; **allow** value between 1.53 g/cm^3 and 0.97 g/cm^3
	b		down the group melting point decreases (1) down the group density increases (1)	[2]	**allow** 'as atomic number rises' as alternative to 'down the group' in either marking point **ignore** references to atomic number / reactivity **allow** one mark for 'melting point decreases and density increases' without reference to 'down the group'
	c		electrons (1) protons and neutrons (1)	[2]	must be in correct order
			Total	[6]	

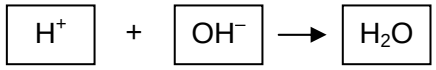
Question			Expected Answers	Marks	Additional Guidance
3	a	i	… both oxidation and reduction. ☐ ☐ ✓ ☐ (1)	[1]	
		ii	copper (1) zinc (1)	[2]	
	b		Lithium is very reactive. ☐ ☐ ✓ ☐ (1)	[1]	
	c		melts (1) ions (1) negative and positive (1)	[3]	
			Total	[7]	

4			nitrogen (1) 7 (1) 8 (1)	[3]	do **not** allow symbol
			Total	[3]	

Question			Expected Answers	Marks	Additional Guidance
5	a		name of gas / element / compound carbon dioxide: ☐ / ✓ nitrogen: ✓ / ☐ argon: ✓ / ☐ oxygen: ✓ / ☐	[2]	all four correct = 2 marks 2 or 3 correct = 1 mark
	b		similarities **any two from:** both contain carbon dioxide; both contain nitrogen; both contain argon; both contain oxygen; both contain only small/similar amount argon; differences (2) **any two from:** Mars has higher % carbon dioxide; Earth has higher % nitrogen; Earth has higher % oxygen; Mars has higher % argon;	[4]	for four marks should have two 'similarity' marks and two 'difference' marks 'both contain all four gases/same gases' = 2 marks **allow** both contain more nitrogen than oxygen **ignore** 'levels are different' for named gases **ignore** unqualified numerical comparisons
	c		other gas/gases are in Mars atmosphere (1)	[1]	**accept** measurements may not be accurate **allow** unknown gas/element present
			Total	[7]	

Question			Expected Answers	Marks	Additional Guidance
6	a	i	90–120 (s) (1)	[1]	**accept** answers in range
		ii	All the acid has been used up. ☐ ☐ ✓ ☐ (1)	[1]	
	b	i	carbon dioxide (1)	[1]	
		ii	chemical → (s) calcium carbonate → (g) gas made in the reaction → (aq) calcium chloride solution → (*l*)	[2]	all four correct = 2 marks two or three correct = 1 mark one correct = 0 marks

Question			Expected Answers	Marks	Additional Guidance
6	b	iii		[2]	all four lines correct = 2 marks two or three lines correct = 1 mark one line correct = 0 marks
			Total	[7]	

7	a		40 16 1 } (1) 111 (1)	[2]	**ignore** units if given if 20 is given for RAM of Ca **allow** a mark for 91
	b		OH^- (1)	[1]	
	c			[1]	H^+ and OH^- can be written in either order in the two boxes on the left of the arrow
			Total	[4]	

8	a		falls/gets less (1) water is lost / water evaporates (1)	[2]	 no mark for 'evaporation' unqualified / solution evaporates
	b		to dry out / make sure (all) water has gone (1)	[1]	allow to evaporate remaining water / get rid of the water do not allow to dry the solution
	c		4.2 (1)	[1]	
			Total	[4]	

A322/02 Modules C4, C5, C6 Higher Tier

Question			Expected Answers			Marks	Additional Guidance
1				true	false	[2]	all five correct = 2 marks three or four correct = 1 mark two or one correct = 0 marks
			Magnesium and …		✓		
			All of the elements …		✓		
			Two of the elements …	✓			
			One of the elements …	✓			
			Carbon has …		✓		
			Total			[2]	

Question			Expected Answers	Marks	Additional Guidance
2	a		**any two from:** properties show a trend/pattern / example of pattern eg melting point/density changes as go down group (1) melting point is between sodium and rubidium / melting point between 39°C and 98°C (1) density is between sodium and rubidium / density between 1.53 g/cm^3 and 0.97 g/cm^3 (1)	[2]	**ignore** references to atomic number /reactivity **allow** value between 39°C and 98°C; **allow** value between 1.53 g/cm^3 and 0.97 g/cm^3
	b		down the group melting point decreases (1) down the group density increases (1)	[2]	**allow** 'as atomic number rises' as alternative to 'down the group' in either marking point **ignore** references to atomic number / reactivity **allow** one mark for 'melting point decreases and density increases' without reference to 'down the group'
	c	i	lithium chloride	[1]	**allow** phonetic spelling but not lithium chlorine
		ii	2Li + Cl_2 → 2LiCl (1)	[1]	numbers in front of Li and LiCl must be large number 2 in Cl_2 must be small **do not allow** any additional numbers 'l' in Cl and 'i' in Li must be lower case **do not allow** CL or LI **ignore** state symbols e.g. (s) (aq) (g) or (l) after the formulae
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
3	a		correct symbols of elements N H O and S (1) correct numbers NO_2SH_7 (1)	[2]	any order symbols must be capitals **not** h or n numbers in formula must be subscripts subscripts must be shown for correct element ie O_2 and H_7 a**llow** 1 mark if only N or S is missed out of fully correct formula ie for O_2SH_7 or NO_2H_7
	b		☐ ☐ Hydrogen atoms are much lighter … ☑ (1) ☐	[1]	
			Total	[3]	

Question			Expected Answers	Marks	Additional Guidance
4	a		When heated, ionic compounds melt. ☐ ✓ ☐ (1) Ions in molten compounds can move. ☐ ✓ ☐ (1)	[2]	
	b		purple grey solid } either order	[2]	all three correct = 2 marks two correct = 1 mark one correct = 0 marks
	c	i	K^+ (1)	[1]	
		ii	$CuBr_2$ (1)	[1]	**do not allow** Cu2Br or $CuBR_2$ **do not allow** any charges shown eg $Cu^{2+}Br_2^-$ **ignore** 'working out' before the formula
			Total	[6]	

Question			Expected Answers	Marks	Additional Guidance
5	a	i	The reaction involves both … ☐ ☐ ☑ ☐ (1)	[1]	
		ii	copper (1) zinc (1)	[2]	
	b	i	Lithium is very reactive. ☐ ☐ ☑ ☐ (1)	[1]	
		ii	e^- (1) $2e^-$ (1)	[2]	**allow** e for e^- **do not allow** e^{2-} or 'electron' in words
	c	i	positive ions / cations (1) surrounded by electrons / in a sea of electrons / delocalised electrons (1)	[2]	**do not allow** positive nucleus **allow** 'free' or 'moving' electrons **max (1) mark** if ionic or covalent bonding mentioned
		ii	electrons <u>move</u> (1)	[1]	**ignore** 'electrons carry the charge'
			Total	[9]	

Question			Expected Answers	Marks	Additional Guidance
6	a		rate slows / reaction slows / less gas given off per unit time (1) reaction stops / no more gas given off (1) acid is used up / acid is neutralised / lower surface area of limestone / fewer collisions (1)	[3]	**ignore** 'less gas given off' i**gnore** 'limestone used up'
	b		faster reaction / gas given off more quickly / reaction takes less time (1) more gas given off (1)	[2]	
			Total	[5]	

Question			Expected Answers	Marks	Additional Guidance
7	a		<table><tr><th></th><th>true</th><th>false</th></tr><tr><td>The mixture has a high pH …</td><td></td><td>✓</td></tr><tr><td>The pH stays constant …</td><td></td><td>✓</td></tr><tr><td>Hydrogen is made …</td><td></td><td>✓</td></tr><tr><td>Water is made …</td><td>✓</td><td></td></tr></table>	[2]	all four correct = 2 marks two or three correct = 1 mark one correct = 0 marks
	b		<table><tr><td>D</td><td>C</td><td>B</td><td>A</td></tr></table>	[2]	leaves out E = 1 mark fully correct = 2 marks
	c	i	40 16 1 } (1) 111 (1)	[2]	**ignore** units if given **if** 20 is given for RAM of Ca **allow** a mark for 91
		ii	OH^- (1)	[1]	
		iii	H^+ + OH^- → H_2O	[1]	H^+ and OH^- can be written in either order in the two boxes on the left of the arrow
			Total	[8]	

Question			Expected Answers	Marks	Additional Guidance
8	a		zinc metal ☑ (1) ☐ zinc carbonate ☑ (1) ☐	[2]	
	b		zinc metal (1)	[1]	
			Total	[3]	

Grade Thresholds

General Certificate of Secondary Education
GCSE Twenty First Century Chemistry A (J634)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
A321/01	Raw	42				22	18	14	10	6	0
	UMS	34				30	25	20	15	10	0
A321/02	Raw	42	28	23	19	15	10	7			0
	UMS	50	45	40	35	30	25	20			0
A322/01	Raw	42				23	19	15	12	9	0
	UMS	34				30	25	20	15	10	0
A322/02	Raw	42	31	24	18	12	8	6			0
	UMS	50	45	40	35	30	25	20			0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J634	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J634	0.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	2

88 candidates were entered for aggregation this series.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums/index.html

Statistics are correct at the time of publication.

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