RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

General Certificate of Secondary Education

Unit **A322/02**: Modules C4, C5, C6 (Higher Tier)

Mark Scheme for January 2012

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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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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	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

Available in scoris to annotate scripts

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response

	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.

b. 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.

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

This would be worth 1 mark.

c. 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.

d. 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**

Question			Answer	Marks	Guidance
1	(a)		the flames flash at different rates [ ] the flames are different colours [✓] sodium burns much faster than potassium [ ] the height of the flames is different in each test [ ]	1	

Question			Answer	Marks	Guidance
1	(b)		**any four from:**	4	**accept** 'pattern' for 'lines' accept other similar words for lines eg bars / marks etc
			mixture contains same (three) lines as potassium / contains spectrum of potassium;		**allow '**mixture contains same line/lines as potassium', but do not allow incorrect number of lines (should be three). **ignore** 'the results show potassium' / 'the results do not show sodium' etc. (same wording as question) **ignore** references to colour
			does not contain the line/spectrum for sodium;		
			extra <u>lines</u> in mixture spectrum / <u>lines</u> in mixture that are not in potassium or sodium spectrum;		**ignore** 'spectrum shows another unknown element' (rewords the question) **accept** 'compound / atom / molecule' for 'element'
			<u>links</u> extra lines to another element in mixture;		**ignore** the numbers of extra lines
			can identify unknown by comparison with spectra for other elements;		need idea of spectrum, not just 'compare to unknown sample'
			each element has a characteristic/unique spectrum;		
			reference to <u>position</u> of lines / idea of lines in the <u>same</u> place;		**ignore** 'in similar places'

Question			Answer	Marks	Guidance
1	(c)		lithium 2.8.1 19	2	<u>if name is missing</u>, **allow** correct symbol, Li i.e not Li_2 / li / LI 3 correct = 2 marks 2/1 correct = 1 mark
			Total	**7**	

2	(a)	(i)	the surface bubbles and fizzes ☐ a flame appears ☐ the surface changes from shiny to dull ✓ the piece of lithium gets smaller ☐	1	
		(ii)	Li_2O (1) CO_3^{2-} or CO_3^{-2} (1)	2	formula must be close to that written, ie Li, not LI, or li. 2 must be subscripted or clearly smaller than Li. **do not accept** Li20 / Li^2O **do not accept** LiO_2 3 must be subscripted. 2- must be superscripted
	(b)	(i)	hydrogen (1)	1	
		(ii)	lithium hydroxide (1)	1	**accept** LiOH (correct formula) **ignore** any other partially correct or incorrect formula

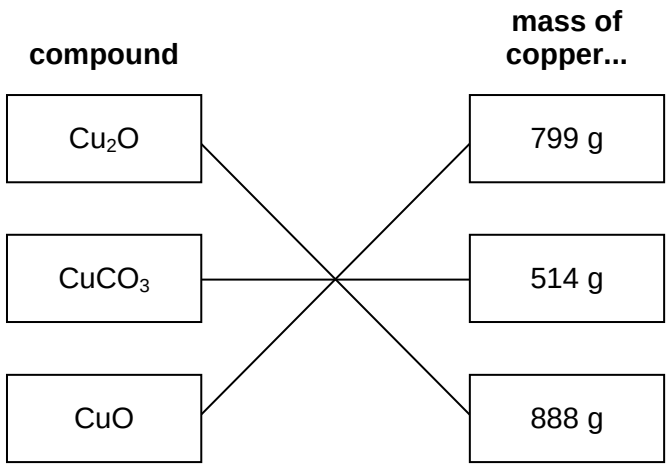
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(c)</td><td>(i)</td><td>
<table>
<tr><td>both elements are in the same vertical column of the Periodic Table</td><td>✓</td><td></td></tr>
<tr><td>they are both non-metal elements</td><td></td><td>✓</td></tr>
<tr><td>the boiling points and densities of both elements are the same</td><td></td><td>✓</td></tr>
<tr><td>an atom of caesium has the same number of protons as a lithium atom</td><td></td><td>✓</td></tr>
<tr><td>the atoms have the same number of electrons in the outer shell</td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>5 correct = 2
3/4 correct = 1
1/2 correct = 0</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>
<table>
<tr><td>the caesium reaction takes a much longer time</td><td></td></tr>
<tr><td>a different gas is made in each reaction</td><td></td></tr>
<tr><td>the caesium reaction is much faster</td><td>✓</td></tr>
<tr><td>the caesium reaction makes an acid</td><td></td></tr>
<tr><td>a different compound is made in each reaction</td><td>✓</td></tr>
</table>
</td><td>1</td><td>need both</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>metallic;

ionic;

covalent</td><td>2</td><td>all correct = 2
2/1 correct = 1</td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><th>statement</th><th>ionic</th><th>covalent</th><th>both</th></tr>
<tr><td>... dissolved in water</td><td>✓</td><td></td><td></td></tr>
<tr><td>...below room temperature</td><td></td><td>✓</td><td></td></tr>
<tr><td>... between molecules</td><td></td><td>✓</td><td></td></tr>
<tr><td>... electrons</td><td></td><td>✓</td><td></td></tr>
<tr><td>... solids at room temperature</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td>3</td><td>all 5 correct = 3 marks
4 correct = 2 marks
3 correct = 1 mark
2/ 1 correct = 0</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
4	(a)		Similarity: both contain carbon, hydrogen <u>and</u> oxygen (atoms); all bonds are covalent; **maximum of three from:** Difference: contain different numbers of carbon, hydrogen <u>and</u> oxygen; sugar contains more carbon / 6 carbons in sugar and 3 carbons in the amino acid; sugar contains more hydrogen / 12 hydrogens in sugar and 7 hydrogens in the amino acid ; sugar contains more oxygen / 6 oxygen in sugar and 2 in the amino acid; amino acid contains nitrogen and/or sulfur / more (different) elements ORA; amino acid is a smaller / lighter molecule / fewer (total) atoms ORA; sugar is a chain (molecule) / amino acid (molecule) is branched;	4	4 marks <u>must include</u> at least one similarity. **ignore** contain C, H and O (not enough) **ignore** 'molecular' bonding **ignore** 'more Cs' or 'more Hs' or 'more Os' if numbers are given, they must be correct. **ignore** C_6 / C^6 etc. **ignore** 'sugar is straight / amino acid is round' or similar
	(b)		$C_3H_7O_2NS$ (1)	1	elements may be in any order eg $C_3H_7SO_2N$ etc **do not accept** lower case letters eg h or n
			Total	**5**	

Question			Answer	Marks	Guidance
5	(a)		63.5 and 79.5	1	need both
	(b)			2	all correct = 2 marks 1 or 2 correct = 1 mark
	(c)		carbon removes oxygen from the copper compound ✓ small amounts of copper are produced copper gives up electrons the mineral is melted down	1	
			Total	**4**	

Question			Answer	Marks	Guidance
6	(a)	(i)	sulfuric (acid) H_2SO_4	1	both needed **accept** formula in a different order eg SO_4H_2 etc. **do not accept** H2SO4 / H^2SO^4; numbers should be half way down the letters or lower.
		(ii)	hydrogen H_2	1	both needed **do not accept** H2 / H^2
	(b)	(i)	experiment 5 (1)	1	
		(ii)	**States a pattern to link concentration to rate**: decreased concentration decreases rate of reaction / increased concentration increases rate of reaction; (1) **Refers to volume or time in the table**: lower volume of acid decreases rate / lower concentration of acid takes a longer time / lower volume of acid takes a longer time; ORA (1)	2	**allow** 'it is faster' / 'gas is made quicker' for increased rate **allow** 'it is slower' for decreased rate **allow** 'less acid' / 'more water' for lower volume of acid **allow** 'more acid' / 'less water' for higher volume of acid; **allow** 'takes longer' for a longer time **ignore** numbers quoted from table without any additional explanation
		(iii)	(acid) <u>particles</u> closer together / more <u>particles</u> per unit volume idea ORA(1) more frequent collisions /collide more often ORA(1)	2	**allow** ions / atoms / molecules for particles **ignore** 'more particles' alone **ignore** 'faster/'slower' collisions / 'takes longer to collide' **ignore** 'more collisions' alone **ignore** 'more successful collisions' **allow** 'more chance of collisions' / collisions are more likely **do not allow** second marking point if answer refers to particles having more or less energy or moving faster or moving more slowly

Question			Answer	Marks	Guidance
6	(c)		zinc carbonate zinc oxide zinc hydroxide	2	3 correct = 2 marks 2 correct = 1 1 correct = 0
			Total	**9**	

7	(a)	(i)	1.0 and 12.0 / 1 and 12;	1	need both
		(ii)	35 / 35.0 (1)	1	
	(b)		**acid A** is more concentrated than **B** ✓ some of..... solution the total volume ..... **acid B** potassium chloride ..... both titrations	1	
	(c)		$H^+ + OH^- \rightarrow H_2O$ / $OH^- + H^+ \rightarrow H_2O$ (1)	1	
			Total	**4**	

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