

Chemistry A

General Certificate of Secondary Education

Unit **A322/01**: Modules C4, C5, C6 (Foundation Tier)

Mark Scheme for January 2013

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.

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










© OCR 2013





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
<u>words</u>	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	credit alternative wording / or words to that effect
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. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- 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.

e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth
1 mark.*

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*This would be worth
0 marks.*

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

*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, e.g. 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-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

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

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question		Answer	Marks	Guidance										
1	(a)	sodium chloride (1); Na (1)	2											
	(b)	<p>It is not necessary to take any safety precautions when handling chlorine gas. <input type="checkbox"/></p> <p>Chlorine is a brown gas. <input type="checkbox"/></p> <p>Chlorine gas has two atoms in each molecule. <input checked="" type="checkbox"/></p> <p>Chlorine is an alkali metal. <input type="checkbox"/></p>	1											
	(c)	<p>The ions move around the water. (1) <input checked="" type="checkbox"/></p> <p>The water changes colour. <input type="checkbox"/></p> <p>The ions get smaller. <input type="checkbox"/></p> <p>The solid compound melts. <input checked="" type="checkbox"/></p> <p>The regular arrangement of ions breaks down. (1) <input checked="" type="checkbox"/></p>	2											
	(d)	<table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">state symbol</th> <th style="text-align: left;">formula</th> </tr> </thead> <tbody> <tr> <td><input type="text" value="(s)"/></td> <td><input type="text" value="BR<sub>2</sub>"/></td> </tr> <tr> <td><input type="text" value="(l)"/></td> <td><input type="text" value="BE<sub>2</sub>"/></td> </tr> <tr> <td><input type="text" value="(g)"/></td> <td><input type="text" value="Br<sub>2</sub>"/></td> </tr> <tr> <td></td> <td><input type="text" value="Be<sub>2</sub>"/></td> </tr> </tbody> </table>	state symbol	formula	<input type="text" value="(s)"/>	<input type="text" value="BR<sub>2</sub>"/>	<input type="text" value="(l)"/>	<input type="text" value="BE<sub>2</sub>"/>	<input type="text" value="(g)"/>	<input type="text" value="Br<sub>2</sub>"/>		<input type="text" value="Be<sub>2</sub>"/>	2	1 mark for the correct line on each side. any additional line scores 0 for that 'side'
state symbol	formula													
<input type="text" value="(s)"/>	<input type="text" value="BR<sub>2</sub>"/>													
<input type="text" value="(l)"/>	<input type="text" value="BE<sub>2</sub>"/>													
<input type="text" value="(g)"/>	<input type="text" value="Br<sub>2</sub>"/>													
	<input type="text" value="Be<sub>2</sub>"/>													
	(e)	sodium bromide	1											
Total			8											

Question		Answer	Marks	Guidance
2	(a)	Cs; 55;	1	both correct for one mark
	(b)	<p><i>any four from:</i></p> <p>lithium has a lower (relative) atomic mass/lithium has an atomic mass of 7, sodium 23; (1)</p> <p>lithium has fewer protons than sodium/lithium has 3 protons, sodium has 11 protons; (1)</p> <p>lithium has fewer electrons than sodium/lithium has 3 electrons, sodium has 11 electrons; (1)</p> <p>lithium has fewer neutrons than sodium/lithium has 4 neutrons, sodium contains 12 neutrons; (1)</p> <p>lithium has fewer electron shells/lithium has 2 shells, sodium has 3/lithium is 2,1 and sodium is 2,8,1; (1)</p> <p>both have 1 electron <u>in outer shell</u>/same number of electrons <u>in the outer shell</u>; (1)</p> <p>(in both types of atom) the number of protons is equal to the number of electrons; (1)</p>	4	<p>ignore lithium has a lower atomic number (in the question)</p> <p>if numbers for protons, electrons, neutrons or shells are given, they must be correct</p> <p>allow correct “dot and cross” diagrams for both atoms</p> <p>if no other marks are scored, allow (1) only for... they contain different numbers of protons/electrons/neutrons/atomic masses;</p>

Question		Answer	Marks	Guidance
	(c)	How quickly the salt evaporates in the flame. <input type="checkbox"/>	1	
		Whether the compound burns. <input type="checkbox"/>		
		The colour of the flame. <input checked="" type="checkbox"/>		
		Whether a gas is given off. <input type="checkbox"/>		
Total			6	

Question		Answer	Marks	Guidance
3	(a)	ions break out of lattice (1) ions are free to move (1)	2	
	(b) (i)	arrow to left	1	accept arrows that are not horizontal, but are pointing towards the correct electrode any arrow in the wrong direction = 0 accept arrows above and below the container but between the electrodes in the correct direction
	(ii)	oxygen	1	accept carbon dioxide/CO ₂
	(c)	metallic	1	

Question		Answer	Marks	Guidance
	(d)	Aluminium is a good conductor of heat. <input type="checkbox"/>	2	
		Aluminium has a lower melting point than some other metals. <input type="checkbox"/>		
		Aluminium is less dense than other metals. <input checked="" type="checkbox"/>		
		Aluminium is softer than most other metals. <input type="checkbox"/>		
		Aluminium is a good electrical conductor. <input checked="" type="checkbox"/>		
Total			7	

Question		Answer	Marks	Guidance
4	(a)	SiO ₂ (1) Al ₂ O ₃ (1)	2	
	(b)	Sodium occurs in other compounds; (1) There is much less chlorine than sodium in the Earth's crust; (1)	2	
Total			4	

Question		Answer	Marks	Guidance												
5	(a)	<table border="1"> <thead> <tr> <th></th> <th>Increases</th> <th>Decreases</th> <th>Same</th> </tr> </thead> <tbody> <tr> <td>carbon dioxide</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>oxygen</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>		Increases	Decreases	Same	carbon dioxide		✓		oxygen	✓			1	
			Increases	Decreases	Same											
		carbon dioxide		✓												
oxygen	✓															
(b)	<p>carbon dioxide contains two elements / two types of atom / carbon and oxygen (1)</p> <p>oxygen contains only one element / only one type of atom/only oxygen <u>atoms</u> (1)</p>	2	<p>assume "it" refers to carbon dioxide</p> <p>ignore "it is a mix of carbon and oxygen"</p> <p>allow "carbon dioxide has more/different elements" or "carbon dioxide has more than one element"</p> <p>not just "pure element" for oxygen</p> <p>not "2 oxygen molecules"</p>													
		Total	3													

Question		Answer	Marks	Guidance
6	(a)	(i)	1	
		<p>The temperature cools during the reaction. <input type="checkbox"/></p> <p>All the acid has been used up. <input checked="" type="checkbox"/></p> <p>All the gas has been used up. <input type="checkbox"/></p> <p>The magnesium carbonate becomes unreactive. <input type="checkbox"/></p>		
		(ii)	1	
		filtration / filtering / filter / decantation / decant		

Question		Answer	Marks	Guidance										
	(b)	<table border="0"> <thead> <tr> <th>chemical</th> <th>state symbol</th> </tr> </thead> <tbody> <tr> <td><input type="text" value="magnesium carbonate"/></td> <td><input type="text" value="(s)"/></td> </tr> <tr> <td><input type="text" value="water"/></td> <td><input type="text" value="(g)"/></td> </tr> <tr> <td><input type="text" value="carbon dioxide"/></td> <td><input type="text" value="(aq)"/></td> </tr> <tr> <td><input type="text" value="magnesium sulfate solution"/></td> <td><input type="text" value="(l)"/></td> </tr> </tbody> </table>	chemical	state symbol	<input type="text" value="magnesium carbonate"/>	<input type="text" value="(s)"/>	<input type="text" value="water"/>	<input type="text" value="(g)"/>	<input type="text" value="carbon dioxide"/>	<input type="text" value="(aq)"/>	<input type="text" value="magnesium sulfate solution"/>	<input type="text" value="(l)"/>	2	all four correct = 2 marks two or three correct = 1 mark one correct = 0 marks
chemical	state symbol													
<input type="text" value="magnesium carbonate"/>	<input type="text" value="(s)"/>													
<input type="text" value="water"/>	<input type="text" value="(g)"/>													
<input type="text" value="carbon dioxide"/>	<input type="text" value="(aq)"/>													
<input type="text" value="magnesium sulfate solution"/>	<input type="text" value="(l)"/>													
	(c) (i)	<table border="0"> <tbody> <tr> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Each line finishes at the same volume.</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		<input type="checkbox"/>	Each line finishes at the same volume.	<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	1			
	<input type="checkbox"/>													
Each line finishes at the same volume.	<input checked="" type="checkbox"/>													
	<input type="checkbox"/>													
	<input type="checkbox"/>													
	(ii)	<table border="0"> <tbody> <tr> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Increasing the temperature of the acid</td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table>		<input type="checkbox"/>		<input type="checkbox"/>	Increasing the temperature of the acid	<input checked="" type="checkbox"/>	1					
	<input type="checkbox"/>													
	<input type="checkbox"/>													
Increasing the temperature of the acid	<input checked="" type="checkbox"/>													
Total			6											

Question		Answer	Marks	Guidance										
7	(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">relative atomic mass</th> </tr> </thead> <tbody> <tr> <td>Ca</td> <td>40</td> </tr> <tr> <td>Cl</td> <td>35.5</td> </tr> <tr> <td>O</td> <td>16</td> </tr> <tr> <td>H</td> <td>1</td> </tr> </tbody> </table> <p style="text-align: center;">(1)</p> <p>relative formula mass of Ca Cl₂ = 111 (1)</p>	relative atomic mass		Ca	40	Cl	35.5	O	16	H	1	2	<p>ignore units if given</p> <p>if 20 is given for RAM of Ca allow a mark for 91</p>
relative atomic mass														
Ca	40													
Cl	35.5													
O	16													
H	1													
	(b)	OH ⁻	1											
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">H⁺</td> <td style="padding: 5px;">+</td> <td style="padding: 5px;">OH⁻</td> <td style="padding: 5px;">→</td> <td style="padding: 5px;">H₂O</td> </tr> </table>	H ⁺	+	OH ⁻	→	H ₂ O	1	H ⁺ and OH ⁻ can be written in either order in the two boxes on the left of the arrow					
H ⁺	+	OH ⁻	→	H ₂ O										
Total			4											

Question		Answer	Marks	Guidance
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	allow to evaporate remaining water / get rid of the water do not allow to dry the solution
	(c)	4.3	1	
Total			4	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2013

