OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

General Certificate of Secondary Education

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

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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.

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	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

NBOD	no benefit of doubt
R	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 <u>and</u> fourth boxes are required for the mark:

This would be worth 1 mark.

This would be worth 0 marks.

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	
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**

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

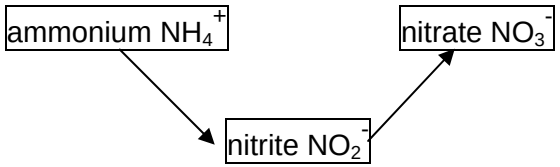
Question			Answer	Marks	Guidance
1	(a)		☐ ☐ ☐ ☐ Potassium iodide is an ionic compound. ✓ Ions in the liquid are free to move. ✓	2	if more than two ticks are given, deduct (1) mark for each additional incorrect tick **allow** other indications of choice
	(b)		lead (1)	1	**allow** led **allow** correct symbol Pb **do not allow** PB
	(c)		e^- / e	1	**do not allow** word 'electron'

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>(d)</td><td></td><td>
<table>
<tr><th></th><th>...increases.</th><th>...stays the same.</th><th>…decreases.</th></tr>
<tr><td>The movement of the ions...</td><td>✓</td><td></td><td></td></tr>
<tr><td>The charge on each ion…</td><td></td><td>✓</td><td></td></tr>
<tr><td>The total number of ions ...</td><td></td><td>✓</td><td></td></tr>
<tr><td>The distance between the ions...</td><td>✓</td><td></td><td></td></tr>
<tr><td>The electrical conductivity of the water …</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
1 or 2 correct = 0 marks</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
2	(a)		*any four from:* lithium has a lower (relative) atomic mass/lithium has an atomic mass of 7, sodium 23; (1) lithium has fewer protons than sodium/lithium has 3 protons, sodium has 11 protons; (1) lithium has fewer electrons than sodium/lithium has 3 electrons, sodium has 11 electrons; (1) lithium has fewer neutrons than sodium/lithium has 4 neutrons, sodium contains 12 neutrons; (1) lithium has fewer electron shells/lithium has 2 shells, sodium has 3/lithium is 2,1 and sodium is 2,8,1; (1) both have 1 electron <u>in outer shell</u>/same number of electrons <u>in the outer shell</u>; (1)	4	**ignore** lithium has a lower atomic/proton number (in the question) if numbers for protons, electrons, neutrons or shells are given, they must be correct **allow** correct 'dot and cross' diagrams for both atoms **if no other marks are scored**, allow (1) only for… they contain different numbers of protons/electrons/neutrons/atomic masses;
	(b)		Heat the compounds in a hot flame. ✓ (1) Dissolve the compounds in water. Electrolyse solutions of the compounds. Look at the spectrum given off by each compound. ✓ (1) Find out which compound is flammable.	2	
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)		(oxide ions/negative ions) move to <u>positive</u> electrode/move to the <u>anode</u> (1) and then... lose electrons/form oxygen molecules/form oxygen gas/form O_2 (1)	2	**ignore** references to movement of metal ions/aluminium ions; **allow** attracted to... for 'move' **accept** 'form oxygen' alone **ignore** 'form oxygen <u>atoms</u>' **ignore** 'forms a gas' alone
	(b)	(i)	162 tonnes	1	
		(ii)	Aluminium ions give up electrons during the electrolysis. ☐ The same total number of electrons is involved in the reaction at each electrode. ✓ More atoms of aluminium are formed than atoms of oxygen. ☐ Aluminium forms at the positive electrode. ☐	1	
			Total	**4**	

Question			Answer	Marks	Guidance
4	(a)		SiO_2 (1) Al_2O_3 (1)	2	
	(b)		Sodium occurs in other compounds; (1) There is much less chlorine in the Earth's crust; (1)	2	
			Total	**4**	

Question			Answer	Marks	Guidance
5	(a)			2	**ignore** extra words in boxes unless more than one name or formula of a substance is given. fully correct = (2) (1) mark for either... all three names correct in correct places; all three formulae correct in correct places; any 2 boxes fully correct;
	(b)	**(i)**	higher <u>percentage</u> mass of C/ORA (1); lower number of carbon <u>atoms</u>/more hydrogen <u>atoms</u>/3 carbon <u>atoms</u> **and** 7 hydrogen <u>atoms</u> (1); hydrogen has a lower <u>atomic</u> mass/hydrogen <u>atoms</u> are lighter/carbon has a mass of 12 **and** hydrogen has a mass of 1 (1);	3	**ignore** 'has 40% mass of carbon and/or 8% hydrogen' **accept** 'higher mass of carbon in the compound' or 'in the molecule' **ignore** 'higher mass of carbon' alone **ignore** 'There are <u>only</u> 3 carbon atoms'; If number of atoms are given, they must be correct. **accept** reverse arguments If atomic masses of atoms are given, they must be correct.
		(ii)	Alanine has a low melting point. ☐ Alanine is soluble in water. ☐ Alanine is non-toxic. ☐ Alanine contains carbon, hydrogen and oxygen. ✓	1	
			Total	**6**	

Question			Answer	Marks	Guidance
6	(a)	(i)	D	1	
		(ii)	A	1	
	(b)		faster reaction/gas given off more quickly/reaction takes less time (1); more gas given off (1)	2	
			Total	**4**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7</td><td>(a)</td><td></td><td>
<table>
<tr><th></th><th>True</th><th>False</th></tr>
<tr><td>Water is made during the reaction.</td><td>✓</td><td></td></tr>
<tr><td>The pH stays constant during the reaction.</td><td></td><td>✓</td></tr>
<tr><td>Hydrogen is made during the reaction.</td><td></td><td>✓</td></tr>
<tr><td>The mixture has a high pH at the start of the reaction.</td><td></td><td>✓</td></tr>
</table>
</td><td>2</td><td>all four correct = 2 marks
two or three correct = 1 mark
one correct = 0 marks</td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><td>E</td><td>A</td><td>B</td><td>C</td></tr>
</table>
</td><td>2</td><td>leaves out D = 1 mark

fully correct = 2 marks</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>
<table>
<tr><th></th><th>relative atomic mass</th></tr>
<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>
</table>
relative formula mass of Ca Cl_2 = 111
</td><td>2</td><td>ignore units if given

if 20 is given for RAM of Ca allow a mark for 91</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>OH^-</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>H^+ + OH^- → H_2O</td><td>1</td><td>H^+ and OH^- can be written in either order in the two boxes on the left</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
8	(a)		zinc carbonate ☑ (1) zinc hydroxide ☐ zinc oxide ☐ zinc metal ☑ (1)	2	
	(b)		zinc metal	1	
			Total	**3**	
			Paper Total	**42**	

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