

Chemistry A

General Certificate of Secondary Education

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

Mark Scheme for June 2012

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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.

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






Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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:

✗
✗

*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	<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:

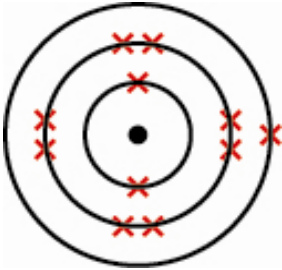
Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level





- 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) (i)	<p><i>any three from:</i></p> <p>trends: melting points decrease down the group / table; (1) boiling points decrease down the group / table ; (1) melting point decreases as boiling point decreases; (1)</p> <p>similarities: formulae of the hydroxides; (1) melting points are all low (for metals); (1) boiling points are all low (for metals); (1) densities are all low (for metals); (1)</p>	3	<p>accept ... increase up instead of ... decrease down ...</p> <p>ignore comments about density</p> <p>ignore references to similar m.p, b.p or density</p>
	(ii)	density; sodium is too high / potassium too low ;	2	<p>accept no trend in formulae (all the same) for [1] not just goes up then down as you go down the group look for evidence related to density from table for the second mark</p>
	(b)	KCl	1	correctly capitalised
Total			6	

Question		Answer	Marks	Guidance
2	(a)	2.7	1	
	(b)		1	
	(c)	protons and neutrons	1	either order
Total			3	

Question		Answer	Marks	Guidance
3	(a)	chlorine – green gas bromine – red-brown liquid iodine – grey solid	2	1 or 2 correct = 1 3 correct = 2
	(b)	(i)		
		(i)	1	if symbols used, formulae must be correct & balanced
		(ii)	1	
		   		
		Total	4	

Question		Answer	Marks	Guidance										
4	(a)	<table border="1"> <thead> <tr> <th>name</th> <th>arrangement of atoms and relative mass</th> </tr> </thead> <tbody> <tr> <td>nitrogen</td> <td> relative mass 32</td> </tr> <tr> <td>oxygen</td> <td> relative mass 40</td> </tr> <tr> <td>argon</td> <td> relative mass 44</td> </tr> <tr> <td>carbon dioxide</td> <td> relative mass 28</td> </tr> </tbody> </table>	name	arrangement of atoms and relative mass	nitrogen	 relative mass 32	oxygen	 relative mass 40	argon	 relative mass 44	carbon dioxide	 relative mass 28	2	all four correct = 2 2 or 3 correct = 1 1 correct = 0
name	arrangement of atoms and relative mass													
nitrogen	 relative mass 32													
oxygen	 relative mass 40													
argon	 relative mass 44													
carbon dioxide	 relative mass 28													
	(b)	<table border="1"> <tbody> <tr> <td>All the gases in the air are elements.</td> <td></td> </tr> <tr> <td>Air contains only non-metal elements.</td> <td>✓</td> </tr> <tr> <td>There are weak attractions between molecules in the air.</td> <td>✓</td> </tr> <tr> <td>All the gases have high melting points and boiling points.</td> <td></td> </tr> <tr> <td>The gases are good conductors of electricity.</td> <td></td> </tr> </tbody> </table>	All the gases in the air are elements.		Air contains only non-metal elements.	✓	There are weak attractions between molecules in the air.	✓	All the gases have high melting points and boiling points.		The gases are good conductors of electricity.		2	
All the gases in the air are elements.														
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All the gases have high melting points and boiling points.														
The gases are good conductors of electricity.														
Total			4											

Question		Answer	Marks	Guidance								
5	(a)	(burning) wood releases carbon dioxide; trees take in carbon dioxide / trees use carbon dioxide (for photosynthesis) / need carbon dioxide to grow; same amount taken in as given out / no carbon (dioxide) is added to the air;	3	ignore references to oxygen reject 'plants breathe in carbon dioxide'								
	(b)	<table border="1"> <tr> <td>hydrogen, oxygen and nitrogen</td> <td>✓</td> </tr> <tr> <td>oxygen, nitrogen and chlorine</td> <td></td> </tr> <tr> <td>silicon, oxygen and nitrogen</td> <td></td> </tr> <tr> <td>iron, hydrogen and oxygen</td> <td></td> </tr> </table>	hydrogen, oxygen and nitrogen	✓	oxygen, nitrogen and chlorine		silicon, oxygen and nitrogen		iron, hydrogen and oxygen		1	
hydrogen, oxygen and nitrogen	✓											
oxygen, nitrogen and chlorine												
silicon, oxygen and nitrogen												
iron, hydrogen and oxygen												
Total			4									

Question		Answer	Marks	Guidance															
6	(a)	The aluminium oxide loses oxygen. ✓	1																
		The density of the aluminium oxide decreases.																	
		The aluminium oxide loses energy.																	
		The volume of the aluminium oxide decreases.																	
	(b)	(i)	ionic; liquid	2															
		(ii)	aluminium at the negative; oxygen at the positive	2	aluminium and oxygen identified uniquely as products = 1 mark														
	(c)	<table border="0"> <tr> <td>use</td> <td></td> <td>most important property</td> </tr> <tr> <td>aircraft</td> <td>—</td> <td>low density...</td> </tr> <tr> <td>power cables</td> <td>—</td> <td>shiny...</td> </tr> <tr> <td>drinks and food cans</td> <td>—</td> <td>surface is non-toxic...</td> </tr> <tr> <td>jewellery</td> <td>—</td> <td>very good electrical conductivity ...</td> </tr> </table>	use		most important property	aircraft	—	low density...	power cables	—	shiny...	drinks and food cans	—	surface is non-toxic...	jewellery	—	very good electrical conductivity ...	2	all four correct = 2 2 or 3 correct = 1 1 correct = 0
use		most important property																	
aircraft	—	low density...																	
power cables	—	shiny...																	
drinks and food cans	—	surface is non-toxic...																	
jewellery	—	very good electrical conductivity ...																	
Total			7																

Question		Answer	Marks	Guidance
7	(a)	hydrochloric acid; water and H ₂ O;	2	not hydrogen chloride, accept phonetic spelling accept (di)hydrogen oxide for water look for correct capitals and subscripts for H ₂ O subscript is at most half height of capital
	(b)	copper hydroxide, copper oxide	1	both needed
	(c)	separate / remove the copper carbonate (in excess); by filtering; through the filter paper/ filter paper goes into funnel; heat the solution (in the basin); to evaporate (the water); stop heating when some solution remains; leave to crystallise over a period of time	4	4 marks can only be awarded if items are in the correct sequence reject references to heating the solid for 4th marking point
		Total	7	

Question		Answer	Marks	Guidance												
8	(a)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 50%;">chemical</td> <td style="text-align: center; width: 50%;">state symbol</td> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 2px;">hydrogen</td> <td style="text-align: center; border: 1px solid black; padding: 2px;">(s)</td> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 2px;">zinc</td> <td style="text-align: center; border: 1px solid black; padding: 2px;">(g)</td> </tr> <tr> <td style="text-align: center; border: 1px solid black; padding: 2px;">dilute sulfuric acid</td> <td style="text-align: center; border: 1px solid black; padding: 2px;">(aq)</td> </tr> </table>	chemical	state symbol	hydrogen	(s)	zinc	(g)	dilute sulfuric acid	(aq)	2	all 3 correct = 2 1 or 2 correct = 1				
chemical	state symbol															
hydrogen	(s)															
zinc	(g)															
dilute sulfuric acid	(aq)															
	(b)	zinc sulfate	1													
	(c)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Use the same mass of zinc but in larger pieces.</td> <td style="width: 50px;"></td> </tr> <tr> <td style="padding: 2px;">Use a higher concentration of acid.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="padding: 2px;">Do the experiment at a lower temperature.</td> <td></td> </tr> <tr> <td style="padding: 2px;">Use a lower mass of zinc.</td> <td></td> </tr> <tr> <td style="padding: 2px;">Increase the surface area of the zinc.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="padding: 2px;">Use a larger gas syringe.</td> <td></td> </tr> </table>	Use the same mass of zinc but in larger pieces.		Use a higher concentration of acid.	✓	Do the experiment at a lower temperature.		Use a lower mass of zinc.		Increase the surface area of the zinc.	✓	Use a larger gas syringe.		2	
Use the same mass of zinc but in larger pieces.																
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Use a lower mass of zinc.																
Increase the surface area of the zinc.	✓															
Use a larger gas syringe.																
	(d) (i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">no reaction is happening</td> <td style="width: 50px;"></td> </tr> <tr> <td style="padding: 2px;">reaction rate is at its fastest</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="padding: 2px;">the reaction is slow but getting faster</td> <td></td> </tr> <tr> <td style="padding: 2px;">the reaction is happening at a constant rate</td> <td></td> </tr> </table>	no reaction is happening		reaction rate is at its fastest	✓	the reaction is slow but getting faster		the reaction is happening at a constant rate		1					
no reaction is happening																
reaction rate is at its fastest	✓															
the reaction is slow but getting faster																
the reaction is happening at a constant rate																
	(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">reaction has stopped</td> <td style="width: 50px; text-align: center;">✓</td> </tr> <tr> <td style="padding: 2px;">reaction rate is at its fastest</td> <td></td> </tr> <tr> <td style="padding: 2px;">reaction is increasing in rate</td> <td></td> </tr> <tr> <td style="padding: 2px;">gas is being given off at a constant rate</td> <td></td> </tr> </table>	reaction has stopped	✓	reaction rate is at its fastest		reaction is increasing in rate		gas is being given off at a constant rate		1					
reaction has stopped	✓															
reaction rate is at its fastest																
reaction is increasing in rate																
gas is being given off at a constant rate																
Total			7													

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

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