

# **Chemistry A**

General Certificate of Secondary Education

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

## **Mark Scheme for June 2011**

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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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Question		Answer	Mark	Guidance													
1	a	sodium chloride (1) Na (1)	2														
	b	Chlorine gas has two atoms in each ... <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1														
	c	The regular arrangement of ions ... <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> The ions move around the water. <input checked="" type="checkbox"/> (1) <input type="checkbox"/>	2														
	d	<table border="0"> <tr> <td style="text-align: center;"><b>state symbol</b></td> <td></td> <td style="text-align: center;"><b>formula</b></td> </tr> <tr> <td><input type="text" value="(s)"/></td> <td></td> <td><input type="text" value="B&lt;sub&gt;2&lt;/sub&gt;"/></td> </tr> <tr> <td><input type="text" value="(l)"/></td> <td rowspan="4" style="text-align: center; border: 2px solid black; padding: 5px;"><b>bromine liquid</b></td> <td><input type="text" value="BR&lt;sub&gt;2&lt;/sub&gt;"/></td> </tr> <tr> <td><input type="text" value="(g)"/></td> <td><input type="text" value="Be&lt;sub&gt;2&lt;/sub&gt;"/></td> </tr> <tr> <td></td> <td><input type="text" value="Br&lt;sub&gt;2&lt;/sub&gt;"/></td> </tr> </table>	<b>state symbol</b>		<b>formula</b>	<input type="text" value="(s)"/>		<input type="text" value="B&lt;sub&gt;2&lt;/sub&gt;"/>	<input type="text" value="(l)"/>	<b>bromine liquid</b>	<input type="text" value="BR&lt;sub&gt;2&lt;/sub&gt;"/>	<input type="text" value="(g)"/>	<input type="text" value="Be&lt;sub&gt;2&lt;/sub&gt;"/>		<input type="text" value="Br&lt;sub&gt;2&lt;/sub&gt;"/>	2	1 mark for the correct line on each side. any additional line scores 0 for that 'side'.
<b>state symbol</b>		<b>formula</b>															
<input type="text" value="(s)"/>		<input type="text" value="B&lt;sub&gt;2&lt;/sub&gt;"/>															
<input type="text" value="(l)"/>	<b>bromine liquid</b>	<input type="text" value="BR&lt;sub&gt;2&lt;/sub&gt;"/>															
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		<input type="text" value="Br&lt;sub&gt;2&lt;/sub&gt;"/>															
		e	sodium bromide (1)	1													
<b>Total</b>			<b>[8]</b>														

Question		Answers	Mark	Guidance
2	a	Cs; 55;	1	<b>both</b> correct for one mark.
	b	<p><b>any four from:</b></p> <p>lithium has a lower (relative) atomic mass/ lithium has an atomic mass of 7, potassium 39</p> <p>lithium has fewer protons than potassium / lithium has 3 protons, potassium has 19 protons ;</p> <p>lithium has fewer electrons than potassium / lithium has 3 electrons, potassium has 19 electrons;</p> <p>lithium has fewer neutrons than potassium / lithium has 4 neutrons, potassium contains 20 neutrons;</p> <p>lithium has fewer electron shells / lithium has 2 shells, potassium has 4 / lithium is 2,1 and potassium is 2,8,8,1 ;</p> <p>both have 1 electron <u>in outer shell</u> / same number of electrons <u>in the outer shell</u>;</p> <p>(in both types of atom) the number of protons is equal to the number of electrons;</p>	4	<p><b>Ignore</b> 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><b>allow</b> correct “dot and cross” diagrams for both atoms</p> <p><b>If no other marks are scored</b>, allow (1) only for... they contain different numbers of protons / electrons / neutrons /atomic masses;</p>

Question		Answers	Mark	Guidance
	<b>c</b>	The colour of the flame. <input type="checkbox"/> <input checked="" type="checkbox"/> (1) <input type="checkbox"/> <input type="checkbox"/>	<b>1</b>	
<b>Total</b>			<b>[6]</b>	

<b>3</b>	<b>a</b>	potassium sulfate/ potassium sulphate (1)	<b>1</b>	
	<b>b</b>	<b>NaNO<sub>3</sub></b> <u>and</u> <b>K<sub>3</sub>PO<sub>4</sub></b> (1)	<b>1</b>	<b>both</b> needed for one mark.
	<b>c</b>	<b>i</b> <b>H<sup>+</sup></b> (1)	<b>1</b>	
		<b>ii</b> <b>Ca(OH)<sub>2</sub></b> (1)	<b>1</b>	
	<b>d</b>	<b>i</b> <b>A D E B C</b>	<b>2</b>	<b>A D</b> first for one mark. all correct for two marks
		<b>ii</b>    titration <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> (1)	<b>1</b>	
<b>Total</b>			<b>[7]</b>	

Question		Answer	Mark	Guidance
4	a	<p style="text-align: right;"> <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/> (1)  <input type="checkbox"/> </p> <p>starts fast and slows down</p>	1	
	b	<p><b>any two from:</b></p> <p>use more concentrated acid;  use smaller pieces of calcium carbonate;  use a higher temperature.</p>	2	<p><b>accept</b> use a catalyst</p> <p><b>ignore</b> “change” temperature/ calcium carbonate etc</p> <p><b>allow</b> increase surface area</p> <p><b>allow</b> “stronger” acid</p> <p><b>ignore</b> just “high” temperature or concentration (should be a comparison)</p>
	c	<p><b>any two from:</b></p> <p>add UI solution / dip paper in;  look at colour / compare to chart.</p>	2	<p><b>accept</b> acid turns UI red / orange</p> <p>do <b>not</b> accept incorrect colour changes</p>
	d	<p>→ calcium chloride (1) + carbon dioxide (1)  H<sub>2</sub>O (1)</p>	3	<p><b>allow</b> the carbon dioxide and calcium chloride either way round</p> <p><b>not</b> superscript numbers, and numbers need to be visibly smaller than the letters</p>
<b>Total</b>			<b>[8]</b>	

Question			Expected Answers				Marks	Additional Guidance
5	a	i	17 (1)				1	
		ii		true	false	2	all 4 correct = 2 marks 2 / 3 correct = 1 mark 1 correct = 0 marks	
			there is more oxygen than nitrogen in the air		✓			
			there is more oxygen than nitrogen in the Earth's crust	✓				
			the air and the Earth's crust contain completely different elements		✓			
			some of the elements in the Earth's crust are metals	✓				
	b		<b>chemicals</b>	<b>formula</b>	<b>element</b>	<b>compound</b>	2	oxygen and nitrogen both elements (1).  carbon dioxide and silicon dioxide both compounds (1).
			oxygen	O <sub>2</sub>	✓			
			nitrogen	N <sub>2</sub>	✓			
			carbon dioxide	CO <sub>2</sub>		✓		
			silicon dioxide	SiO <sub>2</sub>		✓		

Question		Answer	Mark	Guidance
c	i	<p><b>type of bonding</b></p> <p>ionic</p> <p>covalent — <b>oxygen</b> — small molecules</p> <p>metallic</p> <p><b>structure</b></p> <p>atoms held together in a lattice</p> <p>ions with opposite charges attracted to each other</p>	1	
	ii	<p><b>type of bonding</b></p> <p>ionic</p> <p>covalent — <b>silicon dioxide</b> — small molecules</p> <p>metallic</p> <p><b>structure</b></p> <p>atoms held together in a lattice</p> <p>ions with opposite charges attracted to each other</p>	1	
	iii	<p><b>High</b></p> <p><b>Hard</b></p> <p><b>Poor</b></p> <p><b>Does not dissolve</b></p>	2	<p>all four correct = 2 marks</p> <p>2/ 3 correct = 1 mark</p> <p>1 correct = 0 marks</p>
<b>Total</b>			<b>[9]</b>	



Question		Answer	Mark	Guidance
6	a	<p><b>any three from:</b></p> <p>(ions) attracted to electrodes/ (ions) move positive (ions) or lead (ions) (attracted to) negative electrode;</p> <p>negative (ions) or bromide (ions) (attracted to) positive electrode;</p> <p>correct observations at electrodes</p>	3	<p>links movement to correct charges for (2) e.g. positive ions attracted to the negative electrode scores (2)</p> <p>do <b>not</b> allow atoms in place of ions</p> <p><b>not</b> bromine in place of bromide</p> <p><b>allow</b> correct descriptions of oxidation/ reduction</p> <p><b>ignore</b> lead and bromine join/ attract together</p> <p><b>ignore</b> lead/ positive ions attract to the bromide/ negative ions</p>
	b	Bromine (1)	1	
<b>Total</b>			<b>[4]</b>	
<b>Paper Total</b>			<b>[42]</b>	

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