



WJEC Chemistry 1  
Option – Higher Tier  
1.3 Mark Scheme

Higher Tier only questions

Question	Marking details	Marks available				
		AO1	AO2	AO3	Total	Maths Prac
3 (a) (i)	climate change affects the availability of drinking water <input checked="" type="checkbox"/>			1	1	
(ii)	sheets contain holes which are bigger than water molecules but smaller than sodium and chloride ions <input checked="" type="checkbox"/>		1		1	
(b)	$4.2 \times 10^6$ (2) award (1) for $0.3/100 \times 1.4 \times 10^9$ if answer is incorrect ecf possible		2		2	
(c)	(Sun's) heat / (Sun's) energy/ (Sun's) radiation (1) neutral answer: Sun water evaporates / water vapour forms (1) neutral answer: seawater evaporates / steam forms (water) vapour cools on dome / (water) vapour condenses on dome (1) distillation (1) accept desalination award (3) max if reference to boiling / 100 °C					
	<b>Question 3 total</b>	<b>0</b>	<b>5</b>	<b>3</b>	<b>8</b>	<b>2</b> <b>0</b>

Question		Marking details	Marks available						
			AO1	AO2	AO3	Total	Maths	Prac	
5	(a)	(i)	any of following for (1) no more solid will dissolve (in the solvent / water / solution) solid remains (at bottom of beaker) accept: potassium nitrate $\equiv$ solid	1			1		1
		(ii)	46.4 (2) award (1) for 11.6 g if answer is incorrect allow ecf for subtraction error		2		2		2
		(iii)	not all the water has been removed / solid is still wet (1) heat for longer / to a higher temperature (1) until constant mass (1)			3	3		3
		(iv)	temperature do not accept: volume of water			1	1		1
	(b)	(i)	11.9 (2) award (1) for 32 or 87.8 if answer is incorrect allow ecf for multiplication error		2		2		2
		(ii)	0.54 (2) do not accept: 0.5 / 0.538 award (1) for 119 as $M_r(\text{KBr})$ allow ecf for $M_r$ error		2		2		2
			<b>Question 5 total</b>	<b>1</b>	<b>6</b>	<b>4</b>	<b>11</b>	<b>6</b>	<b>9</b>

Question	Marking details	Marks available						
		AO1	AO2	AO3	Total	Maths	Prac	
7	(a)	<p>hard water contains calcium ions / <math>\text{Ca}^{2+}</math> / magnesium ions / <math>\text{Mg}^{2+}</math> (1)</p> <p>(<math>\text{Ca}^{2+}</math> / <math>\text{Mg}^{2+}</math>) swap places with sodium / <math>\text{Na}^+</math> ions (1)</p> <p>accept: swap <math>\equiv</math> change <math>\equiv</math> replaces <math>\equiv</math> exchanges</p> <p>neutral answer: displaces</p> <p>reference to 'ions' needed only once</p>	2			2		2
	(ii)		<p>all <math>\text{Na}^+</math> ions have been removed / no more <math>\text{Na}^+</math> ions left (1)</p> <p>any soluble sodium salt e.g. sodium chloride (1)</p> <p>accept: salt solution</p>	2			2	
	(b)	<p>add soap solution and shake (1)</p> <p>soft water forms lather (1)</p> <p>boil &amp; add soap solution and shake / boil &amp; repeat method (1)</p> <p>temporary hard water forms lather and permanent hard water doesn't (1)</p>	4			4		4
		<b>Question 7 total</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>8</b>

Common questions

Question		Marking details	Marks available						
			AO1	AO2	AO3	Total	Maths	Prac	
9/1	(a)	(i)			2	2			2
		(ii)	1			1			
	(b)								
			3			3			
			4	0	2	6	0		2

Question		Marking details	Marks available						
			AO1	AO2	AO3	Total	Maths	Prac	
10/2	(a)	51 ±1		1			1	1	1
	(i)								
	(ii)	award (3) for 424 if incorrect answer award (1) for readings of 240 and 28 award (1) for 212 × 2 ecf possible		3			3	3	
	(iii)	water would not be liquid / would be a gas above 100 °C			1		1		
	(b)	Na <sup>+</sup> and K <sup>+</sup>	1				1		
	(i)								
	(ii)	electron loss (1) one electron from outer shell (1)	2				2		
	(c)	$3 \text{KNO}_3 + \text{Al(OH)}_3 \rightarrow \text{Al(NO}_3)_3 + 3 \text{KOH}$		1			1	1	
		<b>Question 10/2 total</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>9</b>	<b>5</b>	<b>1</b>	<b>1</b>

Question	Marking details	Marks available						
		AO1	AO2	AO3	Total	Maths	Prac	
10	(a)	award (1) each for any three of following <ul style="list-style-type: none"> <li>at low fluoride concentrations decay is high (8 DMFT) but fluorosis is very mild</li> <li>decay decreases rapidly (from 8 to 3 DMFT) as concentration is increased to 1ppm</li> <li>fluorosis is very mild at concentrations below 1ppm but above that increases rapidly</li> <li>at concentrations above 1 the DMFT does not fall much further</li> </ul>			3	3		
	(b)	4 <sup>th</sup> box studies showed that areas with no fluoridation did not have higher levels of decay than areas that did fluoridate			1	1		
	(c)	3 <sup>rd</sup> box more than one factor affects levels of decay			1	1		
	(d)	medication given to everyone regardless of whether they need it or not	1			1		
		<b>Question 10 total</b>	<b>1</b>	<b>0</b>	<b>5</b>	<b>6</b>	<b>0</b>	<b>0</b>

Question	Marking details	Marks available					Prac
		AO1	AO2	AO3	Total	Maths	
5	(a)						
	(b)		4		4	4	4
				1			
			2		3	3	3
			0	1	7	7	7
		<b>Question 5 total</b>					



### Higher Tier only questions

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths Prac	
4 (a)	award (1) for sensible scale on y-axis e.g. 1 small square = 5 g award (2) for 6 correct points (tolerance $\pm 1/2$ square) award (1) for any 4 or 5 correct points award (1) for curve of best fit		3	1	4	4	
(ii)	308 g (3) accept any answer between 287 and 338 (based on $\pm 1/2$ square tolerance for two readings from graph) if incorrect award (2) for $169 - 46 = 123$ g accept any answer between 115 and 135 (based on $\pm 1/2$ square tolerance for two readings from graph) award (1) for 46 g read from graph ( $\pm 1/2$ square tolerance)		3		3	3	
(b)	ethanol and water have different boiling points / ethanol has a lower boiling point than water / water has a higher boiling point than ethanol (1) award (1) for either of following on heating, ethanol will evaporate first and go into the condenser on heating, ethanol will evaporate at lower temperature and go into the condenser	2			2		2
	<b>Question 4 total</b>	<b>2</b>	<b>6</b>	<b>1</b>	<b>9</b>	<b>7</b>	<b>2</b>

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths Prac	
8 (a)	<p><b>A</b> is permanent hard water (1)</p> <p>it is not softened by boiling (only by ion exchange) / boiling has no effect on the volume of soap needed (1)</p> <p><b>B</b> contains both temporary and permanent hard water (1)</p> <p>as it is partly softened by boiling and further softened by ion exchange / less soap needed after boiling and less again after ion exchange (1)</p>	2		2	4		4
(b)	<p><math>\text{Na}_2\text{CO}_3 + \text{MgCl}_2 \rightarrow 2\text{NaCl} + \text{MgCO}_3</math></p> <p>award (1) for reactants award (1) for products award (1) for balancing - can only be awarded if reactants and products are correct</p> <p>accept multiples of correct balancing ignore state symbols</p>		3		3		
	<b>Question 8 total</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>7</b>	<b>0</b>	<b>4</b>

Question	Marking details	Marks available							
		AO1	AO2	AO3	Total	Maths	Prac		
5									
(a)	Na <sub>2</sub> CO <sub>3</sub>		1		1				
(b)	1:2		1		1	1			
(c)	<p><b>3</b> (1) must have correct number to access second mark</p> <p>award (1) for any of following</p> <ul style="list-style-type: none"> <li>limescale is calcium carbonate</li> <li>no calcium carbonate is formed</li> <li>no calcium <b>ions</b></li> <li>removes the ions that form limescale / sodium ions don't form limescale</li> <li>only sodium hydrogencarbonate is formed</li> <li>sodium hydrogencarbonate is soluble</li> <li>nothing insoluble is formed</li> </ul>	2			2				
(d)	<p>calcium sulfate <input checked="" type="checkbox"/></p> <p>potassium sulfate <input type="checkbox"/></p> <p>magnesium hydrogencarbonate <input type="checkbox"/></p> <p>sodium sulfate <input type="checkbox"/></p>	1			1			1	
	<b>Question 5 total</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>1</b>	