

# Group 1(Alkali metals) – Lithium, Sodium, Potassium

## Mark Scheme 2

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Chemistry
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Single Award (Paper 2C)
<b>Topic</b>	Inorganic Chemistry
<b>Sub-Topic</b>	Group 1 ( Alkali metals) – Lithium, Sodium, Potassium
<b>Booklet</b>	Mark Scheme 2

**Time Allowed:** 39 minutes

**Score:** /32

**Percentage:** /100

**Grade Boundaries:**

9	8	7	6	5	4	3	2	1
>90%	80%	70%	60%	50%	40%	30%	20%	10%

Question number	Answer	Notes	Marks												
1 a i	<table border="1" data-bbox="321 245 1075 532"> <thead> <tr> <th data-bbox="321 245 510 394">Atomic number</th> <th data-bbox="510 245 699 394">Mass number</th> <th data-bbox="699 245 888 394">Number of protons</th> <th data-bbox="888 245 1075 394">Number of neutrons</th> </tr> </thead> <tbody> <tr> <td data-bbox="321 394 510 466"></td> <td data-bbox="510 394 699 466"></td> <td data-bbox="699 394 888 466" style="text-align: center;"><b>19</b></td> <td data-bbox="888 394 1075 466" style="text-align: center;"><b>20</b></td> </tr> <tr> <td data-bbox="321 466 510 532" style="text-align: center;"><b>19</b></td> <td data-bbox="510 466 699 532" style="text-align: center;"><b>41</b></td> <td data-bbox="699 466 888 532"></td> <td data-bbox="888 466 1075 532"></td> </tr> </tbody> </table>	Atomic number	Mass number	Number of protons	Number of neutrons			<b>19</b>	<b>20</b>	<b>19</b>	<b>41</b>			<p><b>M1</b> for 19 protons in top row AND atomic number of 19</p> <p><b>M2</b> for 20 neutrons in top row</p> <p><b>M3</b> for mass number of 41</p> <p><b>ACCEPT</b> <math>\frac{(6 \times 7.4) + (7 \times 92.6)}{100}</math></p> <p>Answer must be to 1 dp Correct final answer without working scores 2 marks</p>	3
Atomic number	Mass number	Number of protons	Number of neutrons												
		<b>19</b>	<b>20</b>												
<b>19</b>	<b>41</b>														
ii	<p><b>M1</b> <math>(6 \times 0.074) + (7 \times 0.926)</math></p> <p><b>M2</b> = 6.9</p>	<p><b>ACCEPT</b> (hydrogen) gas given off/evolved/formed/produced <b>IGNORE</b> name of gas</p> <p><b>ACCEPT</b> melts</p> <p><b>ACCEPT</b> dissolves</p> <p><b>IGNORE</b> colour of flame / explodes</p>	2												
b	<p>any two from</p> <ul style="list-style-type: none"> <li>• effervescence/fizzing/bubbles</li> <li>• potassium moves/darts/floats</li> <li>• potassium leaves white trail</li> <li>• potassium forms into a ball</li> <li>• potassium becomes smaller/disappears</li> <li>• (lilac) flame</li> </ul>	<p><b>ACCEPT</b> (hydrogen) gas given off/evolved/formed/produced <b>IGNORE</b> name of gas</p> <p><b>ACCEPT</b> melts</p> <p><b>ACCEPT</b> dissolves</p> <p><b>IGNORE</b> colour of flame / explodes</p>	2												

Question number	Answer	Notes	Marks
1 c i	pink	<b>ALLOW</b> red <b>IGNORE</b> purple	1
	ii OH <sup>-</sup> / HO <sup>-</sup>		1
d	<p><b>M1</b> potassium loses its outer/valence electron more easily/readily</p> <p><b>M2</b> because it is further from (the attraction of) nucleus (and therefore less strongly attracted to the nucleus)</p>	<p><b>IGNORE</b> references to more shells / larger atomic radius / more shielding / more screening</p> <p><b>ACCEPT</b> reverse arguments as long as it is clear that lithium is being considered</p>	2

Question number	Answer	Notes	Marks
2 a	<p><b>M1</b> twice as much/more carbon dioxide removed (per mole reacted)</p> <p><b>M2</b> produces oxygen (for breathing)</p>	<p><b>ACCEPT</b> reverse arguments for both <b>M1</b> and <b>M2</b> eg lithium hydroxide removes less CO<sub>2</sub> and does not produce oxygen scores 2</p> <p><b>IGNORE</b> references to the need to remove water in reaction 1</p>	2
b i	<p><b>M1</b> <math>n(\text{CO}_2) = \frac{100}{44}</math> OR 2.27(27....) (mol)</p> <p><b>M2</b> <math>n(\text{LiOH}) = \text{answer to M1} \times 2</math> OR 4.54(54.....) (mol)</p> <p><b>M3</b> <math>m(\text{LiOH}) = (\text{answer to M3} \times 24) = 110</math> (g)</p> <p><b>OR</b></p> <p><b>M1</b> 48 (g) reacts with 44 (g)</p> <p><b>M2</b> x (g) reacts with 100 (g)</p> <p><b>M3</b> x = 110 (g)</p>	<p><b>ACCEPT</b> any number of sig figs except one eg 109 / 109.1 / 109.09 / 109.0909.....</p> <p>Award 3 marks for correct final answer without working</p> <p>108.96 (from 2.27) scores 3 marks 110.4 (from 2.3) scores 3 marks</p>	3

Question number	Answer	Notes	Marks
2 b ii	<p><b>M1</b> <math>n(\text{Li}_2\text{O}_2) = \frac{100}{46} = 2.17(3913\dots)</math> mol (= <math>n\text{CO}_2</math>)</p> <p><b>M2</b> volume of <math>\text{CO}_2</math> = answer to <b>M1</b> <math>\times</math> 24 000</p> <p><b>M3</b> = 52 000 (<math>\text{cm}^3</math>)</p>	<p><b>ACCEPT</b> any number of sig figs except one eg 52 170, 52 174, 52 173.9, etc</p> <p>Award 3 marks for correct final answer without working</p> <p>52 080 (from 2.17) scores 3 marks 52 800/53 000 (from 2.2) scores 3 marks</p>	3

Question number	Answer	Notes	Marks
3 (a)	bubbles / fizzing / effervescence  sodium moves / darts / floats sodium gets smaller / disappears sodium melts / forms ball white trail	Accept gas given off/evolved/formed/produced Accept hydrogen gas Ignore identity of gas  Accept equivalents such as shoots/skims Accept dissolves  Do not apply list principle Assume that it = sodium Ignore flames / sparks Any two for 1 each	2
(b)	Do not apply list principle	Assume that it = sodium	1
(c) i	hydrogen / H <sub>2</sub>	Ignore H	1
ii	K <sup>+</sup>		1

Question number	Answer	Notes	Marks
3 (d)	<p>Na is 2.8.1 K is 2.8.8.1</p> <p>outer/valence electron / outer shell / electron lost in K further from nucleus/protons</p> <p>less attracted by nucleus</p>	<p>Accept other punctuation and no punctuation and diagrams in place of full stops If neither of M1 and M2 scored, allow potassium has more (electron) shells (or numbers of shells stated)/energy levels for 1 mark?</p> <p>Ignore potassium further from nucleus</p> <p>Accept (electron) more easily removed/lost /less energy needed to remove (electron) Accept potassium more willing to lose electron If no reference to nucleus or protons, then neither M3 nor M4 can be awarded A correct reference to nucleus/protons is needed before M3 and M4 can be awarded Ignore references to shielding Accept reverse arguments for sodium in M3 and M4</p>	<p>1 1</p> <p>1</p> <p>1</p>
<b>Total</b>			<b>9</b>

Question number	Expected Answer	Accept	Reject	Marks
4	<ul style="list-style-type: none"><li>• Fizzing occurs (box 2)</li><li>• potassium moves around (box 4)</li><li>• potassium melts (box 5)</li><li>• a lilac flame is seen (box 7)</li></ul> <p>[If more than four boxes are ticked, deduct a mark for each incorrect answer above four]</p>			1  1  1  1

**Total 4 Marks**