<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 a i</td><td>
<table>
<tr><th>Atomic number</th><th>Mass number</th><th>Number of protons</th><th>Number of neutrons</th></tr>
<tr><td></td><td></td><td>19</td><td>20</td></tr>
<tr><td>19</td><td>41</td><td></td><td></td></tr>
</table>
</td><td>M1 for 19 protons in top row AND atomic number of 19

M2 for 20 neutrons in top row

M3 for mass number of 41</td><td>3</td></tr>
<tr><td>ii</td><td>M1 $(6 \times 0.074) + (7 \times 0.926)$

M2 = 6.9</td><td>ACCEPT $\frac{(6 \times 7.4) + (7 \times 92.6)}{100}$

Answer must be to 1 dp
Correct final answer without working scores 2 marks</td><td>2</td></tr>
<tr><td>b</td><td>any two from
• effervescence/fizzing/bubbles
• potassium moves/darts/floats
• potassium leaves white trail
• potassium forms into a ball
• potassium becomes smaller/disappears
• (lilac) flame</td><td>ACCEPT (hydrogen) gas given off/evolved/formed/produced
IGNORE name of gas

ACCEPT melts

ACCEPT dissolves

IGNORE colour of flame / explodes</td><td>2</td></tr>
</table>

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

Question number	Answer	Notes	Marks
2 a	**M1** twice as much/more carbon dioxide removed (per mole reacted) **M2** produces oxygen (for breathing)	**ACCEPT** reverse arguments for both **M1** and **M2** eg lithium hydroxide removes less CO_2 and does not produce oxygen scores 2 **IGNORE** references to the need to remove water in reaction 1	2
b i	**M1** $n(CO_2) = \frac{100}{44}$ OR 2.27(27....) (mol) **M2** n(LiOH) = answer to **M1** x 2 OR 4.54(54.....) (mol) **M3** m(LiOH) = (answer to **M3** x 24) = 110 (g) **OR** **M1** 48 (g) reacts with 44 (g) **M2** x (g) reacts with 100 (g) **M3** x = 110 (g)	**ACCEPT** any number of sig figs except one eg 109 / 109.1 / 109.09 / 109.0909..... Award 3 marks for correct final answer without working 108.96 (from 2.27) scores 3 marks 110.4 (from 2.3) scores 3 marks	3

Question number	Answer	Notes	Marks
2 b ii	**M1** $n(Li_2O_2) = \frac{100}{46} = 2.17(3913.....)$ mol (= nCO_2) **M2** volume of CO_2 = answer to **M1** × 24 000 **M3** = 52 000 (cm^3)	**ACCEPT** any number of sig figs except one eg 52 170, 52 174, 52 173.9, etc Award 3 marks for correct final answer without working 52 080 (from 2.17) scores 3 marks 52 800/53 000 (from 2.2) scores 3 marks	3

Question number	Answer	Notes	Marks
3 (a)	bubbles / fizzing / effervescence	Accept gas given off/evolved/formed/produced Accept hydrogen gas Ignore identity of gas	2
	sodium moves / darts / floats sodium gets smaller / disappears sodium melts / forms ball white trail	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	
(b)	Do not apply list principle	Assume that it = sodium	1
(c) i	hydrogen / H_2	Ignore H	1
ii	K^+		1

Question number	Answer	Notes	Marks
3 (d)	Na is 2.8.1 K is 2.8.8.1	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?	1 1
	outer/valence electron / outer shell / electron lost in K further from nucleus/protons	Ignore potassium further from nucleus	1
	less attracted by nucleus	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	1
		Total	**9**

Question number	Expected Answer	Accept	Reject	Marks
4	• Fizzing occurs (box 2) • potassium moves around (box 4) • potassium melts (box 5) • a lilac flame is seen (box 7) [If more than four boxes are ticked, deduct a mark for each incorrect answer above four]			1 1 1 1

Total 4 Marks