<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1(a)</td><td><table><tr><th>Description of reaction</th><th>Metal</th></tr><tr><td>it explodes on contact with water</td><td>caesium</td></tr><tr><td>it fizzes gently</td><td>lithium</td></tr><tr><td>it reacts violently and forms a lilac flame</td><td>potassium</td></tr></table></td><td>3 correct = 2 marks
1 correct = 1 mark

accept symbols</td><td>2</td></tr>
<tr><td>(b) (i)</td><td>M1 – hydrogen

M2 – H_2</td><td>ignore symbol or formula even if incorrect

reject H
accept H_2(g) as a product in an equation

ignore name even if incorrect
accept LiOH as a product in an equation</td><td>1

1</td></tr>
<tr><td>(ii)</td><td>M1 – lithium hydroxide

M2 – LiOH</td><td>ignore formula even if incorrect

ignore name even if incorrect</td><td>1

1</td></tr>
<tr><td>(iii)</td><td>M1 – add (red) litmus

M2 - turns blue

OR

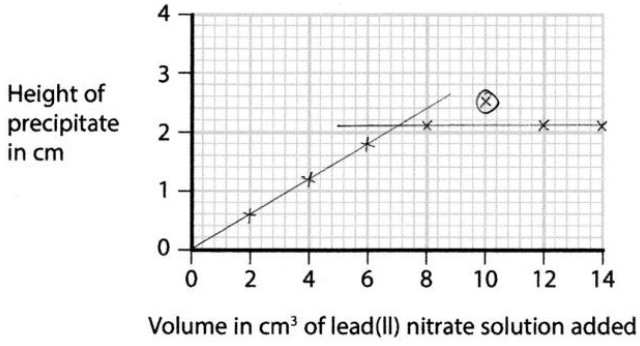
M1 – use a pH meter / measure pH

M2 - pH > 7</td><td>accept any named indicator

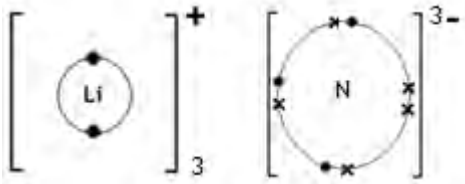
accept correct colour for named indicator
ignore purple

M2 DEP on M1
do not award M1 or M2 if blue litmus is used</td><td>1

1</td></tr>
<tr><td colspan="4">Total 8 marks</td></tr>
</table>

Question number	Answer	Notes	Marks
2 (a)	<u>all</u> of the sodium chloride has reacted / the sodium chloride has been used up	Accept no more sodium chloride left (to react) Accept sodium chloride is the limiting reagent reject all reactants used up Ignore reaction has stopped/is complete	1
(b) (i)		**M1 & M2** - all points correctly plotted deduct one mark for each point incorrectly plotted **M3** – two straight lines drawn lines must be drawn with the aid of a ruler first line does not need to go through origin second line must be horizontal **M4** – lines intersect **M4** dep on **M3**	2 1 1
(ii)	circle drawn around point (2.5,10)		1
(iii)	A (the precipitate was not allowed to settle before its height was measured)		1
(iv)	no precipitate is produced when no lead(II) nitrate is added	Accept the height of precipitate is (directly) proportional to the volume of lead(II) nitrate (added) Accept the two variables (plotted) are (directly) proportional (to one another)	1 1

(v)	7 (cm^3)	Ignore no reaction / reaction not started accept any value between 6.8 and 7.2	
			Total 9 marks

Question number	Answer	Accept	Reject	Marks
3 (a)	 **M1** – for both electron diagrams correct IGNORE inner electrons of N even if incorrect **M2** – for both charges correct **M3** – for correct ratio of ions	any combination of dots and crosses		3
(b)	$6Li + N_2 \rightarrow 2Li_3N$ **M1** – all formulae correct **M2** – balanced **M2** dep on **M1** IGNORE state symbols even if incorrect	multiples and fractions		2
(c) (i)	l aq g			1
(ii)	**M1 –** any number from 8 to 14			1
	M2 – LiOH/lithium hydroxide is a base/alkali **OR** hydroxide <u>ions</u>/OH^- formed/present	ammonia / <u>metal</u> hydroxides / <u>Group 1</u> hydroxides are bases/alkalis		1

(d)	ions cannot move OR ionic compounds <u>only</u> conduct when molten/in solution IGNORE references to electrons	ionic compounds do not normally conduct when solid		1

(Total marks for Question 3 = 9 marks)

Question number			Answer	Notes	Marks
4	a		C (good electrical conductor… and basic oxide)		1
	b	i	effervescence / fizzing / bubbles sodium moves / darts / floats sodium melts / forms a ball sodium becomes smaller / disappears white trail	Accept gas given off /gas evolved / gas formed / gas produced Accept wrongly identified gas Accept equivalents such as shoots/skims Accept dissolves Ignore white precipitate Do not apply list principle Assume that it = sodium Ignore flames/sparks Any two for 1 each	2
		ii	l aq g		1 1
	c		hydrogen/gas/potassium burns / flame / fire / sparks	Accept explodes Ignore references to more vigorous reaction / more fizzing	1
	d		(all have) 1 electron in outer shell	Accept (all have) same number of outer electrons	1

(Total for Question 4 = 7 marks)

Question number	Answer	Notes	Marks
5 (a)	(because) a precipitate was formed/a reaction took place each time Y was used OR no precipitate was formed/no reaction took place when X and Z were added together	accept 'it reacts with X and Z (to form a precipitate)' allow use of correct names for X, Y and Z	1
(b)	**M1** X is (sodium) iodide and Z is (sodium) chloride **M2** because X gives yellow precipitate or Z gives white precipitate **OR** **M1** X is (sodium) iodide because it forms a yellow precipitate **M2** therefore Z is (sodium) chloride **OR** **M1** Z is (sodium) chloride because it forms a white precipitate **M2** therefore X is (sodium) iodide		2

(c)	**M1** no change/no reaction with (sodium) chloride **M2** colour change (to brown solution) with (sodium) iodide	 accept ‘orange’ / ‘orange-brown’ accept ‘grey/black <u>precipitate</u>’ reject incorrect colour change	2

Question number	Answer	Notes	Marks
6 (a)	$3Mg + N_2 \rightarrow Mg_3N_2$ **M1** formula for magnesium nitride correct **M2** rest of equation correct	 **M2** dep on **M1**	2
(b) (i)	**M1** (damp) red litmus (paper) **M2** turns blue **OR** **M1** mix with hydrogen chloride/HCl **M2** white solid/smoke forms	reject 'blue litmus' for both **M1** and **M2** accept any suitable indicator with correct colour change, eg phenolphthalein turns red/pink reject 'hydrochloric acid' / 'HCl(aq)' but accept 'fumes from conc. hydrochloric acid' ignore 'fumes'	2

(b)	(ii)	**M1** M_r of lithium nitride = 35 **M2** (1.40 ÷ 35 =) 0.04(0) (mol)	correct answer scores (2)	2
	(iii)	**M2** from (b)(ii) x 3 / 0.04(0) x 3 = 0.12 (mol)		1
	(iv)	**Using answer to b(iii)** **M1** answer to (b)(iii) ÷ 2 / 0.12 ÷ 2 = 0.06(0) (mol) **M2** answer to **M1** ÷ 0.500 / 0.06(0) ÷ 0.500 **M3** 0.12 dm^3 / 120 cm^3 **Using answer to b(ii)** **M1** answer to (b)(ii) ÷ 2 / 0.04(0) ÷ 2 = 0.02(0) (mol) **M2** answer to **M1** ÷ 0.500 / 0.02(0) ÷ 0.500 **M3** 0.04 dm^3 / 40 cm^3		3

Question number	Answer	Notes	Marks
7 a	C (lithium reacts with water to form an alkali)		1
b	A (have the same number of outer shell electrons)		1
c	(similar) bubbles / fizzing / effervescence OR moves / darts / floats OR gets smaller / disappears potassium shows a flame / sparks / explodes OR potassium melts / forms ball	Accept gas given off /evolved/formed/produced Accept hydrogen gas Ignore identity of gas Accept dissolves Accept reverse arguments for lithium	1 1
d	K_2O KCl	Accept K_2O_2 and KO_2 Reject KO If formula shown as product of an equation, ignore reactants and balancing Ignore coefficients	1 1
e	s l aq g		1
f	85 AND 87 calculated (even if not identified) (85 × 0.72) + (87 × 0.28) = 85.6	Accept 37+48 and 37+50 Correct final answer = 2 marks 85.5 or 85.56 = 1 mark No ECF from incorrect mass numbers Ignore units	1 1
			Total 9 marks

Question number	Answer	Accept	Reject	Marks
8 (a)	**M1** electronic configuration / 2.1, 2.8.1, 2.8.8.1 **M2** same number of electrons in outer shell / one electron in outer shell **OR** the number of electrons in the outer shell determines the chemical properties	electronic structure / arrangement of electrons		1 1
(b)	melting point / melting temperature			1
(c) (i)	burns with a pop/squeak (when mixed with air and ignited)	use burning/lit spill / flame to see if pop/squeak splint for spill	glowing spill just 'squeaky pop test'	1
(ii)	s l aq g	capital letters		1
(iii)	**M1** turns blue **IGNORE** purple			1
	M2 alkaline solution formed/alkali formed/hydroxide ions formed/LiOH is an alkali/LiOH forms hydroxide ions	OH^- for hydroxide ions pH is greater than 7		1
	IGNORE references to lithium hydroxide is a metal hydroxide **M2** dep on **M1** correct or missing			

	(d)	Similarities - any two from: • floats • moves around • fizzes/effervesces/bubbles/produces gas/produces hydrogen • disappears/dissolves • forms a solution Differences – any two from: Potassium: • more vigorous/move around faster/reacts faster/fizzes more/explodes • flame (IGNORE colour)/catches fire • forms a ball/bead/melts	forms an alkali/forms a hydroxide react vigorously exothermic/gives out heat reverse arguments for lithium comparison between the two, eg only potassium catches fire, they react at different rates		2 2
8	(e) (i)	$4Li + O_2 \rightarrow 2Li_2O$ **IGNORE** state symbols **M1** formulae **M2** balancing **M2** dep on **M1**	multiples and halves		2
	(ii)	2 (1) (1)	multiples and halves		1
				Total	**14**