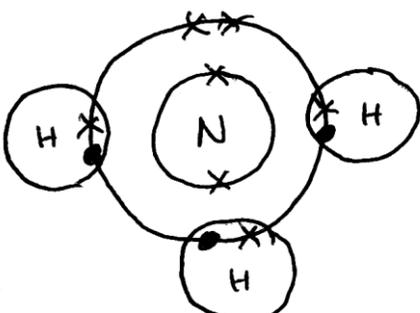


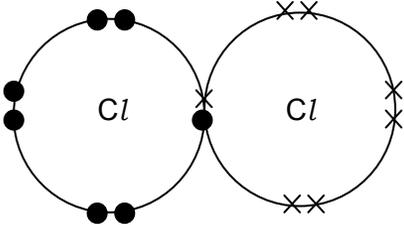
Question	Answer	Marks	Guidance
1 a i	W (1)	1	allow sodium / Na
ii	Z (1)	1	allow argon / Ar
iii	W and Y (1)	1	both required but order is unimportant allow sodium or Na and chlorine or Cl
b	At least one pair of electrons shared correctly between nitrogen and hydrogen (1) remainder of structure correct (1) 	2	can use all dots or all crosses not ionic structures = 0 for the question allow Lewis diagrams i.e. without circles allow lone pair electrons as two single electrons ignore inner electrons on nitrogen
c	solid – ions not free / ions cannot move / ions held in a lattice / ions in a giant structure (1) dissolved in water – ions can move (1)	2	ignore electrons / particles cannot move in a solid allow has free ions not electrons can move in a liquid ignore particles can move in a liquid
Total		7	

Question	Answer	Marks	Guidance
2 a	collision frequency (between ions) is high (1)	1	<p>allow large number of collisions (between ions) every second / lots of collisions (between ions) per unit time / high chance of collision (between ions) / highly likelihood of collisions (between ions)</p> <p>not collision frequency between atoms or molecules is high</p> <p>allow collision frequency between Pb^{2+} and I^- is high</p> <p>allow positive and negative ions attract / oppositely charged ions attract</p> <p>allow has a low activation energy</p> <p>ignore ions cancel out</p>
b	idea of ion that is in the solution at start and at the end of the reaction (1)	1	<p>allow an ion present that takes no part in the reaction / ion that does not react / they do not contribute towards the reaction</p> <p>ignore they do not change state during the reaction</p>
c	<p>Any two from:</p> <p>idea of results can be replicated / allows peer review (1)</p> <p>idea that further evidence can be collected / can be used by other scientists to develop the work (1)</p> <p>to gain funding (1)</p> <p>idea of recognition (1)</p>	2	<p>allow so the work can be checked</p> <p>allow so other scientists can help</p>
	Total	4	

Question		Answer	Marks	Guidance
3		<p>D (1)</p> <p>contains a sulfate because of white precipitate with barium chloride (1)</p> <p>contains a chloride because of white precipitate with silver nitrate (1)</p>	3	<p>If any other letter given = 0 marks</p> <p>If no letter given maximum of two marks</p> <p>allow barium chloride is a test for sulfate</p> <p>allow silver nitrate is a test for chloride</p> <p>allow for one mark contains a sulfate and a chloride / forms a precipitate with barium chloride and silver nitrate</p>
		Total	3	

Question		Answer	Marks	Guidance
4	(a)	solvent evaporates / water evaporates (1)	1	allow liquid evaporates ignore binding medium oxidises not binding medium evaporates
	(b)	pigment C because (pigment C) is a thermochromic pigment / changes colour when temperature increases (1) (pigment will) act as a warning as the kettle heats up / indicates when the water is boiling / indicates when the water is hot (1)	2	marks are for explanation no marks if wrong pigment is chosen allow it changes colour as it is heated but not changes colour as heat increases
	(c)	pigment is dispersed throughout the mixture / solid scattered throughout the mixture / solid is dispersed throughout the mixture (1) (pigment or solid) particles are sufficiently small so as not to settle to the bottom (of the liquid) (1)	2	not pigment or solid dissolves allow pigment or solid particles are too small to separate from the liquid not reference to emulsifiers or detergents
		Total	5	

Question	Answer	Marks	Guidance
5	<p>Level 3 Candidate applies knowledge to predict the name of both products AND predicts a reaction time for rubidium AND writes a correctly balanced symbol equation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 EITHER Candidate applies knowledge to predict the names of both products AND predicts a reaction time for rubidium OR predicts a reaction time for rubidium AND attempts a symbol equation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 EITHER Candidate applies knowledge to predict the names of both products OR predicts a reaction time for rubidium and the name of one product OR candidate attempts a symbol equation. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0marks)</p>	6	<p>This question is targeted at grades up to A*.</p> <p>Indicative scientific points may include:</p> <p>Names of Products</p> <ul style="list-style-type: none"> hydrogen must be stated but can be in a word equation rubidium hydroxide must be stated but can be in a word equation <p>Reaction Time</p> <ul style="list-style-type: none"> any time less than 7 seconds / reaction time less than potassium <p>Equation</p> <ul style="list-style-type: none"> $2\text{Rb} + 2\text{H}_2\text{O} \rightarrow 2\text{RbOH} + \text{H}_2$ or correct multiple <p>note $\text{Rb} + \text{H}_2\text{O} \rightarrow$ product / formula is an attempt to write an equation</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
		6	

Question		Answer	Marks	Guidance
6	(a)	(add up number of electrons) and this is the atomic number (and check on periodic table) (1)	1	<p>allow has 20 electrons and on periodic table element number 20 is calcium</p> <p>allow element is in Group 2 and Period 4</p> <p>it has 20 electrons on its own is not sufficient</p>
	(b)	<p>one shared pair of electrons between the chlorine atoms (1)</p> <p>rest of outer shells correct (1)</p>	2	<p>allow electrons to be all crosses or all dots</p>  <p>ignore inner shell electrons even if incorrect</p> <p>do not allow diagrams with charges / diagrams with double bonds = 0 marks</p>
	(c)	<p>sodium (atoms) lose electrons (1)</p> <p>chlorine (atoms) gain electrons (1)</p>	2	<p>allow sodium ions have more protons than electrons</p> <p>not sodium ions lose electrons</p> <p>allow chloride ions have more electrons than protons</p> <p>not chloride ions gain electrons</p>

	(d)	(chlorine molecule) gains electron(s) (1)	1	
	(e)	$Cl_2 + 2KI \rightarrow 2KCl + I_2$ OR $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$ correct formulae (1) correct balancing – dependent on correct formulae (1)	2	ignore state symbols allow = instead of \rightarrow allow any correct multiple including fractions not & or and instead of + allow one mark for correct equation with minor errors of subscript, superscript and case eg $c\bar{l}2 + 2KI \rightarrow 2KCl + I^2$
		Total	8	