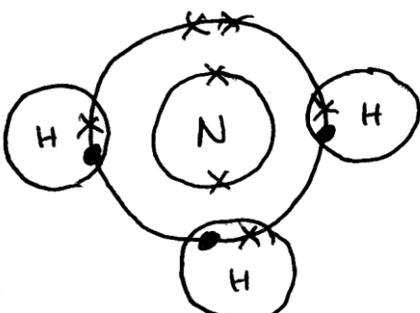


Question	Answer	Marks	Guidance
1 a i	W (1)	1	<b>allow</b> sodium / Na
ii	Z (1)	1	<b>allow</b> argon / Ar
iii	W and Y (1)	1	both required but order is unimportant <b>allow</b> sodium or Na <b>and</b> chlorine or Cl
b	At least one pair of electrons shared correctly between nitrogen and hydrogen (1)  remainder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

Question	Answer	Marks	Guidance
2 a	collision frequency (between ions) is high (1)	1	<p><b>allow</b> 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><b>not</b> collision frequency between atoms or molecules is high</p> <p><b>allow</b> collision frequency between <math>\text{Pb}^{2+}</math> and <math>\text{I}^-</math> is high</p> <p><b>allow</b> positive and negative <b>ions</b> attract / oppositely charged ions attract</p> <p><b>allow</b> has a low activation energy</p> <p><b>ignore</b> 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><b>allow</b> an ion present that takes no part in the reaction / ion that does not react / they do not contribute towards the reaction</p> <p><b>ignore</b> they do not change state during the reaction</p>
c	<p><b>Any two from:</b></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><b>allow</b> so the work can be checked</p> <p><b>allow</b> so other scientists can help</p>
	<b>Total</b>	<b>4</b>	

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

Question		Answer	Marks	Guidance
4	(a)	solvent evaporates / water evaporates (1)	1	<b>allow</b> liquid evaporates <b>ignore</b> binding medium oxidises <b>not</b> binding medium evaporates
	(b)	pigment <b>C</b>  because (pigment <b>C</b> ) 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	<b>marks are for explanation</b>  no marks if wrong pigment is chosen  <b>allow</b> it changes colour as it is heated but <b>not</b> 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	<b>not</b> pigment or solid dissolves  <b>allow</b> pigment or solid particles are too small to separate from the liquid  <b>not</b> reference to emulsifiers or detergents
		<b>Total</b>	<b>5</b>	

Question	Answer	Marks	Guidance
5	<p><b>Level 3</b>  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><b>Level 2</b>  <b>EITHER</b>  Candidate applies knowledge to predict the names of both products AND predicts a reaction time for rubidium  <b>OR</b>  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><b>Level 1</b>  <b>EITHER</b>  Candidate applies knowledge to predict the names of both products  <b>OR</b>  predicts a reaction time for rubidium and the name of one product  <b>OR</b>  candidate attempts a symbol equation.  Quality of written communication impedes communication of the science at this level.  (1 – 2 marks)</p> <p><b>Level 0</b>  Insufficient or irrelevant science. Answer not worthy of credit.  (0marks)</p>	6	<p><b>This question is targeted at grades up to A*.</b></p> <p><b>Indicative scientific points may include:</b></p> <p><b>Names of Products</b></p> <ul style="list-style-type: none"> <li>hydrogen must be stated but can be in a word equation</li> <li>rubidium hydroxide must be stated but can be in a word equation</li> </ul> <p><b>Reaction Time</b></p> <ul style="list-style-type: none"> <li>any time less than 7 seconds / reaction time less than potassium</li> </ul> <p><b>Equation</b></p> <ul style="list-style-type: none"> <li><math>2\text{Rb} + 2\text{H}_2\text{O} \rightarrow 2\text{RbOH} + \text{H}_2</math> or correct multiple</li> </ul> <p><b>note</b> <math>\text{Rb} + \text{H}_2\text{O} \rightarrow</math> product / formula is an attempt to write an equation</p> <p><b>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</b></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><b>allow</b> has 20 electrons and on periodic table element number 20 is calcium</p> <p><b>allow</b> element is in Group 2 and Period 4</p> <p>it has 20 electrons on its own is <b>not</b> 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><b>allow</b> electrons to be all crosses or all dots</p> <p><b>ignore</b> inner shell electrons even if incorrect</p> <p><b>do not allow</b> 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><b>allow</b> sodium ions have more protons than electrons</p> <p><b>not</b> sodium ions lose electrons</p> <p><b>allow</b> chloride ions have more electrons than protons</p> <p><b>not</b> chloride ions gain electrons</p>

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