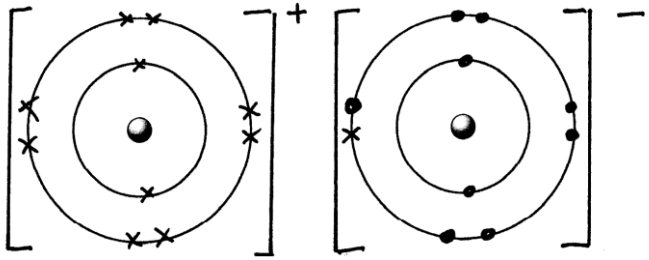
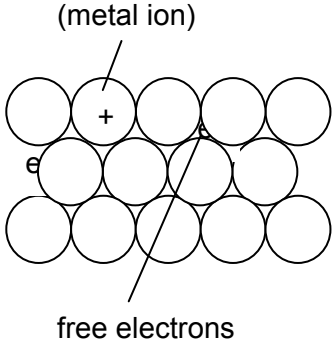
Question	Answer	Marks	Guidance
1	**Level 3** **Candidate applies knowledge to predict the name of both products AND predicts a reaction time for rubidium AND writes a correctly balanced symbol equation.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0marks)	6	**This question is targeted at grades up to A*.** **Indicative scientific points may include:** **Names of Products** • hydrogen must be stated but can be in a word equation • rubidium hydroxide must be stated but can be in a word equation **Reaction Time** • any time less than 7 seconds / reaction time less than potassium **Equation** • $2Rb + 2H_2O \rightarrow 2RbOH + H_2$ or correct multiple **note** $Rb + H_2O \rightarrow$ product / formula is an attempt to write an equation **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
		6	

Question	Answer	Marks	Guidance
2 a	melting point of sodium – any value between 90 and 130 (1) atomic radius of rubidium – any value between 0.250 and 0.280 (1)	2	
b	$2Na + 2H_2O \rightarrow 2NaOH + H_2$ correct formulae (1) balancing – dependent on correct formulae (1)	2	**allow** any correct multiple including fractions e.g. $4Na + 4H_2O \rightarrow 4NaOH + 2H_2$ **allow** = or ⇆ for arrow **not** 'and' or & for + **allow** one mark for correct balanced equation with minor errors of case, subscript or superscript e.g. $2NA + 2H_2O \rightarrow 2NaOH + H^2$ (1)
c	all have one electron in their outer shell (1)	1	**allow** orbit or energy level rather than shell **allow** have same number of electrons in outer shell (1) **allow** all lose one electron to make an ion / all lose one electron to get a stable outer shell / all lose 1 electron to get a stable outer octet / all lose 1 electron to get a complete outer shell (1) they all lose 1 electron is **not** sufficient on its own all have a single electron is **not** sufficient **ignore** to make stable atom

Question	Answer	Marks	Guidance
d	 Na^+ F^- correct sodium ion / 2.8 (1) correct fluoride ion / 2.8 (1)	2	two correct electronic structures but no charges award one mark two correct charges with incorrect electronic structure award one mark one structure of 2,8 but unlabelled is **not** sufficient **but allow** both have a structure of 2,8 (1) the ionic charges must **not** be shown in the nucleus award 0 marks for structures with shared electrons One electronic structure must be labelled in some way to indicate which ion is which in order to score two marks. **allow** answers showing the transfer of electrons providing the same electrons are not shown twice all electrons can be dots or crosses
	Total	**7**	

Question			answer	Marks	Guidance
3			**Level 3 (5–6 marks)** **Candidate applies knowledge of the reaction of alkali metals to predict some observations or comments of the reaction of caesium with water including a comparison of the rate of reaction with lithium** **AND** **Constructs the balanced symbol equation for the reaction between caesium or lithium and water.** Quality of written communication does not impede communication of science at this level. **Level 2 (3–4 marks)** **Candidate applies knowledge of the reaction of alkali metals to predict some observations or makes comments about the reaction between caesium and water** **AND** **gives the names or formulae of products formed in the reaction between caesium and water.** Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** **Candidate applies knowledge of the reaction of alkali metals to predict some observations or makes comments about the reaction between caesium and water** **OR** **gives the names or formulae of products formed in the reaction between caesium and water.** Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A** **Indicative scientific points at level 3 must include:** • $2Cs + 2H_2O \rightarrow 2CsOH + H_2$ **OR** $2Li + 2H_2O \rightarrow 2LiOH + H_2$. • faster reaction than with lithium / more reactive / more violent **Indicative scientific points at levels 1, 2 and 3 may include:** • caesium + water → caesium hydroxide + hydrogen • lithium + water → lithium hydroxide + hydrogen • hydrogen made • caesium hydroxide made • bubbles • fizzes • floats • moves on the surface • gives a flame • gets smaller • forms a colourless solution • alkaline solution formed • explodes • caesium loses electrons more easily
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		K (1)	1	**allow** potassium
	(b)		idea of an attraction or bond(ing) between positive ions and electrons (1) (closely packed) metal ions and delocalised electrons (1)	2	**do not allow** intermolecular forces / covalent bonding / ionic bonding / metal molecules = 0 for the question **allow** positive atoms, cations, positive ions instead of metal ions and free electrons instead of delocalised electrons. **allow** has electrons free to move instead of delocalised or free electrons / sea of electrons instead of delocalised electrons **allow** mark could be found on a labelled diagram 
			Total	**3**	

Question			Answer	Marks	Guidance
5	(a)	(i)	68 (cm^3) (1)	1	
		(ii)	37–39 (seconds) (1)	1	
		(iii)	line needs to level off at same height and be steeper initially (1)	1	By eye the line should go through the origin Line drawn to left of original and must not go above 79 cm^3 at any point but must end at 78 cm^3
	(b)		reactant not in excess / that is all used up (at the end of the reaction (1)	1	**allow** reactant that determines the volume of hydrogen given off (1) **allow** substance that causes the reaction to stop **allow** reagent that runs out (first)
			Total	**4**	

Question			answer	Marks	Guidance
6	(a		zinc + copper sulfate → copper + zinc sulfate (1)	1	**allow** = instead of → **not** and or & in equation **allow** reactants and products in any order **not** copper(II) as one of the products **allow** mix of words and correct formulae **ignore** state symbols **allow** correct symbol equation even if not balanced $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$ **allow** correct name with an incorrect formula but not incorrect name with correct formula
	(b)		iron or top reaction loses **electrons** which is oxidation (1) oxygen or bottom reaction gains **electrons** which is reduction (1)	2	no mark for identifying which reaction is oxidation and which is reduction **allow** water gains electrons which is reduction
			Total	**3**	

Question	Answer	Marks	Guidance
7 a	(purification processes) do not remove dissolved or soluble substances (1)	1	**allow** they are soluble / they are dissolved
b	large energy requirement (1) expensive (1)	2	**allow** heat for energy **allow** high cost of equipment **allow** issues related to scaling up / needs lots of water (1) **ignore** takes a long time
c	Pete is right about **A** but wrong about **B** (no mark) **A** contains copper (ions) because it gives a blue (ppt) with sodium hydroxide (1) **A** contains sulfate (ions) because it gives a white (ppt) with barium chloride (1) **B** contains iron(III) (ions) because it gives a brown (ppt) with sodium hydroxide (1) **B** does **not** contain sulfate (ions) as it does **not** give a white (ppt) with barium chloride (1)	4	**allow** Pete is wrong **not** Pete is wrong about **A** for marks about **A** **not** Peter is correct for **B** for marks about **B** copper sulfate goes blue with sodium hydroxide is **not** sufficient copper sulfate goes white with barium chloride is **not** sufficient iron(III) sulfate goes brown with sodium hydroxide is not sufficient **B** is not iron(III) sulfate because it does not go white with barium chloride is not sufficient **allow B** does not contain sulfate as it does not give a ppt **allow A** and **B** both cannot be sulfates since they do not both go white with barium chloride (2)
	Total	**7**	

Question			Answer	Marks	Guidance
8	(a		strong acid is fully ionised (in water) (1) weak acid is only partially ionised (1)	2	**allow** dissociated for ionised
	(b)	(i)	ethanoic acid contains a low**er** concentration of hydrogen ions (than hydrochloric acid) (1) so lower collision frequency (1)	2	**allow** ethanoic acid contains less crowded hydrogen ions / hydrogen ions in ethanoic acid are further apart / ora **allow** ethanoic acid has a high**er** pH / ora **allow** collisions less often / less chance of a collision / fewer collisions per second / ora if specified for hydrochloric acid
		(ii)	both contain the same number of moles of magnesium (1)	1	**allow** both contain the same amount of magnesium / both contain same mass of magnesium (1) **ignore** magnesium is the limiting reagent **not** same number of moles of acid
			Total	**5**	