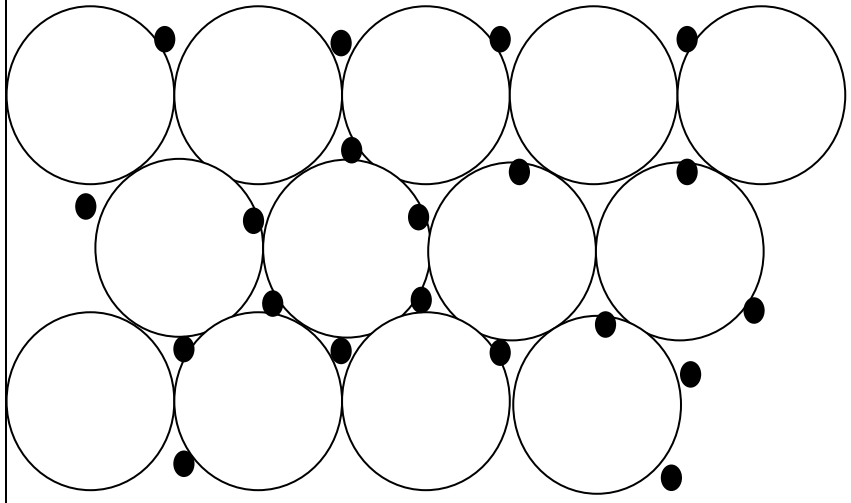
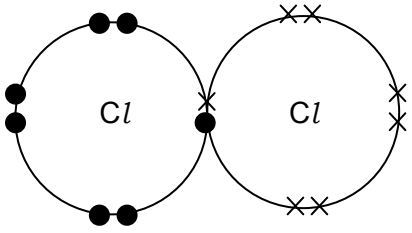
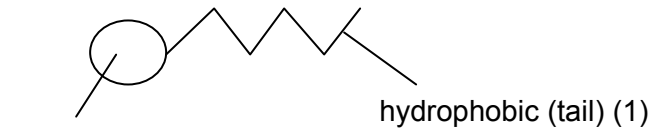
Question	Answer	Marks	Guidance
1 a	**C** high(est) heat conductivity (1) high melting point (1)	2	no mark for choice **allow** a (very) good heat conductor **allow** will not melt when heated on a stove / does not melt easily **allow A** due to a (fairly) high melting point (1) **allow D** due to good heat conductivity (1) and either high melting point or low density / lightweight (1) ignore light **ignore** other properties
b	idea of (close packed) positive metal ions (1) idea electrons interspersed within the particles drawn / sea of electrons / delocalised electrons (1) electrons can move / free electrons / electrons can carry the current (1)	3	 Large circle labelled positive ion / metal ion / cation Small circle labelled electron / e / e^- **but** just a negative sign is not sufficient Mention of intermolecular forces / covalent bonds / ionic bonds can only score the electrons can move mark
	Total	**5**	

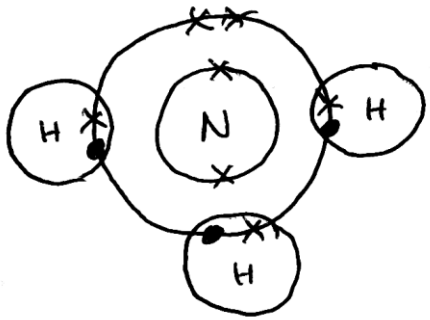
Question			answer	Marks	Guidance
2	(a)		(add up number of electrons) and this is the atomic number (and check on periodic table) (1)	1	**allow** has 20 electrons and on periodic table element number 20 is calcium **allow** element is in Group 2 and Period 4 it has 20 electrons on its own is **not** sufficient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

	(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 → **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*l*2 + 2KI → 2KCl + I^2
			Total	**8**	

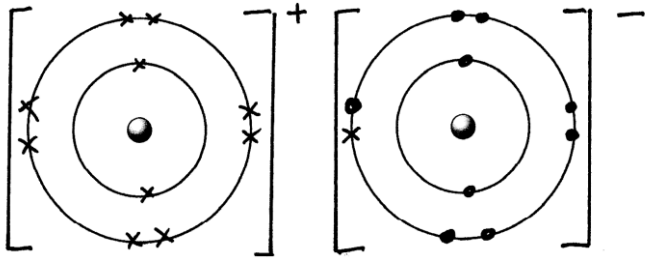
Question			Answer	Marks	Guidance
3	(a)		weak forces between the layers (1) which are easy to break (so layers can slide over each other) (1)	2	**allow** van der Waals' forces between layers / weak intermolecular forces **not** weak covalent bonds between layers
	(b)		large number of strong (covalent) bonds (1) needs lots of energy to break / AW (1)	2	**allow** giant molecular structure or giant covalent structure / large number of strong bonds (between atoms) **allow** heat for energy but **ignore** high temperature **any mention of intermolecular bonds / forces scores 0**
			Total	**4**	

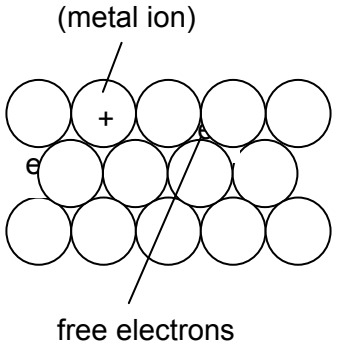
Question			Answer	Marks	Guidance
4	(a)		carbon dioxide / CO_2 (1)	1	**ignore** CO2 / CO^2 **ignore** steam
	(b)		the protein molecule is denatured / the shape of the protein molecule changes (1)	1	**ignore** protein molecule is broken down **allow** structure changes **allow** intermolecular forces are broken
			Total	**2**	

Question	Answer	Marks	Guidance
5 a	**B** (1) not poisonous (1) no smell (1)	3	**A** or **C** scores 0 for the question **allow** ora, eg A is not suitable as it is poisonous (1) **allow** ora, eg D is not suitable as it has a smell (1) **allow D** since it is not poisonous (1)
b i	 hydrophobic (tail) (1) hydrophilic (head) (1)	2	**allow** one mark if the correct labels are swapped around **allow** a straight line for the tail **ignore** water loving / water hating
ii	**any two from:** **cell** walls rupture (1) (resulting in) loss of (rigid) structure / a softer texture (1) starch grains swell up (1)	2	 **allow cell** walls break down or burst (1) **ignore** cellulose breaks down **allow** potato becomes softer (1) **allow** starch (molecules) swell up (1) **ignore** cells swell up **ignore** references to surface area **ignore** references to denaturing **ignore** references to proteins
	Total	**7**	

Question	Answer	Marks	Guidance
6 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
7 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
8	(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**	