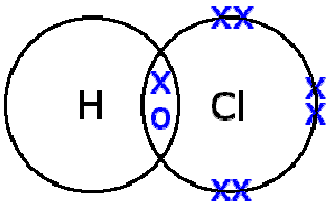
Question Number	Answer	Acceptable answers	Mark
1(a)	C : copper sulfate and sodium chloride		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	copper sulfate (1) blue-green (1) or sodium chloride (1) yellow (1) colour mark consequential on correct metal (compound)	allow blue or green or green-blue reject orange and yellow-orange	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	An explanation linking weak **inter**molecular forces /weak forces between **molecules** (1) little {heat / energy} needed to separate (molecules) (1)	 bonds / attractions in place of forces intermolecular forces between {atoms / bonds} loses 1st marking point any answer in terms of covalent or ionic bonding scores zero	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	A description linking use separating funnel (1) run off lower {layer / liquid} / OWTTE (1)	 alternative description of separating funnel eg funnel with a tap at the bottom suitable labelled diagram burette allow layers / liquids to separate ignore fractional distillation	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(d)	 shared pair in molecule (1) rest of molecule consequent on first mark (1)	Allow a diagram without labels for 2 marks any symbols shown must be correct for the 2nd mark allow any combination of dots and crosses for electrons wrong compound = zero marks	**(2)**

Question Number	Answer	Mark
2(a)		**(3)**

	symbol		number of electrons	
	atom	**ion**	**atom**	**ion**
chlorine				18
sodium		Na^+	11	

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	$NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$ • reactant formulae (1) • product formulae (1)	$Ag^+ + Cl^- \rightarrow AgCl$ ignore state symbols do not give (2) if incorrectly balanced	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	to remove other ions that would also form a white precipitate		**(1)**

Question Number		Indicative content	Mark
QWC	***2(c)**	An explanation linking some of the following points For a sample to conduct electricity • charged particles must be present • they must be free to move water does not conduct because it • is (simple molecular) covalent • exists as molecules • contains no/(very few) charged particles solid sodium chloride does not conduct because • although it contains ions / cations / anions • which are charged particles • they are not free to move • because they are held together • by strong • electrostatic forces/ ionic bonds • in lattice sodium chloride solution conducts because • ions / cations / anions are present • which are charged particles • they are free to move • because the water has cut down the forces between the ions • ions have separated • move to electrode of opposite charge	**(6)**
Level	**0**	No rewardable content	
1	**1-**	• a limited explanation e.g. water is covalent and sodium chloride is ionic • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, puncuation and grammar are used with limited accuracy	
2	**3-**	• a simple explanation e.g. water is covalent and does not conduct because there are no charged particles: sodium chloride is ionic therefore solution conducts because ions move • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, puncuation and grammar are used with some accuracy	
3	**5-**	• a detailed explanation e.g. in solid sodium chloride the ions are held in a lattice by strong forces but in sodium chloride solution the ions are free to move: water is covalent so contains no charged particles • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, puncuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	B lead chloride		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	An explanation linking two of • strong (electrostatic) forces of attraction • between oppositely charged ions • so requires lot of heat/energy to overcome forces/break bonds	Any reference to molecules/molecular/intermolecular/covalent scores 0 marks strong (ionic) bonds positive and negative ions reject charged atoms for this mark ignore hard to melt/high temperature needed	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	A description including • M1 add (dilute) nitric acid • M2 add silver nitrate (solution) • M3 forms white ppt/solid	Accept correct formulae If use any other acid can score M2 and M3 dependent on use of silver nitrate Alternative method: Electrolyse (1) Chlorine formed (1) Bleaches litmus/pH paper (1) Ignore smell	**(3)**

Question Number		Indicative Content	Mark
QWC	**3(b)**	A description including some of the following points **ion formation** • magnesium atoms lose electrons • each magnesium atom loses two electrons • to acquire full outer shell • magnesium (configuration) becomes 2.8 • forms Mg^{2+} ion • electrons transferred to oxygen atoms • oxygen atoms gain electrons • each oxygen atom gains two electrons • oxygen (configuration) becomes 2.8 • to acquire full outer shell • forms O^{2-} ion **structure** • magnesium ions attract oxide ions • due to opposite charges • ions pack close together • ratio of ions 1: 1 • ions arranged in lattice • giant (ionic) (structure) diagram can be credited for any points	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description e.g. magnesium atoms lose electrons and oxygen atoms gain electrons e.g. magnesium oxide is a giant structure • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description e.g. magnesium atoms lose two electrons to form positive ions and oxygen atoms gain two electrons to form negative ions • e.g. magnesium atoms lose electrons and oxygen atoms gain electrons and magnesium oxide is a giant structure • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description e.g. each magnesium atom transfers two electrons to an oxygen atom and the opposite charged ions (Mg^{2+} /O^{2-}) formed attract each other to form a giant (ionic) lattice • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A carbonate ion CO_3^{2-}		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A description including warm / heat / boil (1) {**gas/ammonia**} turns (damp red/pink) litmus blue / (damp red/pink) litmus turns blue when held above (the mixture)(1)	maximum (1) if additional reagents added ignore any ppt allow pungent smell / smell of {ammonia/wet nappies} /alkaline **gas /** effect of ammonia on other named indicators /dense white fumes with conc hydrochloric acid ignore litmus turns blue in ammonium ions/sodium hydroxide/mixture do not allow gas/ammonia if blue litmus turns red/pink	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	$Al^{3+} + 3OH^- \rightarrow Al(OH)_3$ OH^- (1) $Al(OH)_3$ (1) balancing 3, conditional on correct formulae (1)	allow multiples allow HO^- (1) allow $Al(HO)_3$ (1) do not allow $Al(HO)^3$/lower case h ignore state symbols/$3Na^+$ on both sides	**(3)**

Question Number		Indicative Content	Mark
QWC	***4(c)**	An explanation including some of the following points **test for cation** • flame test • if the flame is yellow/not lilac, sodium ions are present • if the flame is lilac/not yellow, potassium ions are present **test for iodide ions** • make a solution of the crystals in water • add dilute nitric acid • add silver nitrate solution • if there is a yellow precipitate, iodide ions are present • if there is no precipitate, sulfate ions are present • $Ag^+ + I^- \rightarrow AgI$ OR • make a solution of the crystals in water • add chlorine water • then cyclohexane • if the cyclohexane/top layer turns purple, iodide ions were present • if there is no colour change, sulfate ions are present • $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ **test for sulfate ions** • make a solution of the crystals in water • add dilute {hydrochloric/nitric} acid • add barium {chloride/nitrate} solution • if there is a white precipitate, sulfate ions are present • if there is no precipitate, iodide ions are present • $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of test for any 1 ion e.g. flame test, yellow flame, sodium ions are present. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description to identify a cation and an anion e.g. if the substance is sodium sulfate, it will give a yellow flame in a flame test and a white precipitate with barium chloride solution. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description to identify at least 3 ions e.g. carry out a flame test, yellow flame, sodium ions present, lilac flame, potassium ions present, add silver nitrate solution to solution of substance, yellow precipitate, iodide ion. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	