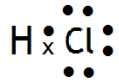
Question number	Answer	Notes	Marks
1 a	covalent	Ignore references to polar bonding and electron sharing	1
b	M1 weak forces (of attraction) between molecules / weak intermolecular forces M2 (therefore) little (thermal/heat) <u>energy</u> required to overcome the forces / separate the molecules	Accept bonds for forces for both M1 and M2 Reject atoms for both M1 and M2 Accept particles for molecules Accept correctly named IMF eg van der Waals' Ignore more easily separated / easier to break if any reference to/implication of breaking covalent or ionic bonds scores 0/2 M1 and M2 indep	2
c	M1 (strong) attraction between bonding/shared pair of electrons M2 (and) nuclei of (both atoms) **OR** M1 bonding/shared pair of electrons M2 (strongly) attracted to nuclei (of both atoms)	Do not award M2 if reference to only one nucleus Do not award M2 if reference to only one nucleus	2

d		M1 for 2 electrons shared between one H and one Cl M2 rest of molecule fully correct M2 DEP on M1 Accept any combination of dots and crosses Ignore inner shells of electrons in chlorine if overlapping touching/circles are used both electrons must be within the overlapping/touching area symbols do not need to be shown if overlapping touching /circles are used	2
e	M1 (effervescence) due to hydrogen (gas) M2 solution A is acidic / contains H^+ / contains hydrochloric acid M3 solution B is not acidic / does not contain H^+ / does not contain hydrochloric acid	Accept hydrogen chloride/HCl does not ionise/ dissociate If only reference to HCl ionises/dissociates allow max one mark for M2 and M3, ie reference to either H^+ or acid(ic) needed to score both marks Ignore the bonds between H and Cl are not broken (when HCl dissolved) in methylbenzene Do not award M3 if any reference to methylbenzene reacting or dissociating	3

Question number	Answer	Notes	Marks
2 (a) (i)	**M1** – (covalent) bonds have to be broken	any mention of ions / metallic bonding / molecules / intermolecular forces scores 0/2	1
	M2 – large amount of energy required / bonds are strong	Accept large number of bonds to be broken Accept forces (of attraction) between <u>atoms</u> in place of bonds	1
(ii)	the (covalent) bonding in silicon dioxide is stronger (than the (ionic) bonding in sodium chloride)	Accept the covalent bonds (in silicon dioxide) are stronger than the ionic bonds (in sodium chloride) Accept more energy is required to break the (covalent) bonds in silicon dioxide (than is required to break the (ionic) bonds in sodium chloride) Accept forces (of attraction) between <u>atoms</u> in place of bonds	1
(b)	<u>ions</u> flow/move (to the electrodes)	Accept ions are mobile/can move reject electrons	1
(c)	weak forces (of attraction) between <u>molecules</u> / weak <u>intermolecular</u> forces (of attraction) / little energy is required to separate <u>molecules</u>	Accept boiling point is below room temperature reject any mention of covalent bonds broken	1

Question number				Answer	Notes	Marks
3	a	i	M1	H—O—H with both bonds represented by 2 shared electrons	Accept 2 dots, 2 crosses or 1 of each Atoms do not have to be labelled with H or O If wrongly labelled, only M1 can be awarded	1
			M2	8 electrons in outer shell of O AND 2 electrons in outer shell of both H	Ignore inner shell of O Reject if H has 2 shells M2 dependent on M1	1
		ii	M1	(strong electrostatic) attraction between bonding/shared pair of electrons	Must refer to pair or two electrons	1
			M2	and nuclei (of hydrogen and oxygen)	Accept word nucleus instead of nuclei if clear reference to 2 atoms 0/2 if any mention of ions / electron transfer M2 dependent on mention of both attraction and electrons in M1	1

Question number				Answer	Notes	Marks
3	b	i	M1	idea of electron transfer / loss and gain of electrons		1
			M2	direction of transfer, eg sodium to oxygen / sodium loses and oxygen gains		1
			M3	correct number of electrons involved, eg (each) sodium loses 1 and oxygen gains 2	Ignore charges on ions Ignore covalent 0/3 if any mention of electron sharing All marks may be scored on diagrams or by reference to electronic configurations Max 2 if molecules mentioned	1
		ii	M1	(sodium) loses electron(s)	Ignore oxygen gains electrons	1

Question number				Answer	Notes	Marks
3.	c		M 1	attractions between water molecules are weak(er) / easily overcome / need little energy to break	Allow (named) intermolecular forces in place of attractions	1
			M 2	attractions between (sodium and oxide) ions are strong(er) / ionic bonds are strong /need a lot of energy to break	Do not award M2 if any mention of intermolecular forces / metallic bonding Any implication of <u>breaking</u> covalent bonds = 0/2	1

Question number				Answer	Notes	Marks
3	d	i	M1 M2 M3	s l aq	All three correct = 2 marks Two correct = 1 mark One/none correct = 0 marks Do not award M1 for g or if not possible to be sure that it is s and not g Do not award marks for abbreviations such as sol / liq	2
		ii	M1 M2	blue / purple OH^- / hydroxide	Allow indigo or violet M1 and M2 independent	1 1

Total 14 marks

Question number				Answer	Notes	Marks
4	a		M1	NH_4^+	Award 1 if wrong way around	1
			M2	Cl^-	Penalise missing charges both times	1
	b	i	M1	(add) sodium hydroxide/NaOH (solution) (and warm)	Accept any identified Group 1 or Group 2 hydroxide If no reagent added, max 1 mark for correct test AND result even if dipped into solution If just hydroxide or OH^- ions, do not award M1 but continue marking If any other incorrect reagent added, then 0/3	1
			M2	test (gas / ammonia) with (damp red) litmus (paper) OR test with hydrogen chloride / conc HCl	Accept use of universal indicator Accept holding litmus above tube etc Reject blue litmus for M2 and M3 Do not penalise ammonium instead of ammonia in M2 Do not allow (dilute) hydrochloric acid	1
			M3	(litmus paper) turns blue OR <u>white</u> smoke/solid/powder	Do not award M3 if litmus dipped into solution (even if only implied)	1
		ii	M1	(add) silver nitrate/$AgNO_3$ (solution)	If missing or incorrect reagent, 0/3	1
			M2	(dilute) nitric acid	Do not accept any other acid or just acidified If acid missing or wrong, M3 can still be awarded	1
			M3	white precipitate / solid / suspension	If bleaching litmus paper mentioned, only M1 can be awarded	1

Question number				Answer	Notes	Marks
4	c		M1	reversible / goes both ways	Ignore equilibrium	1
	d	i	M1	ammonium chloride / NH_4Cl	Do not accept ammonia chloride If name and formula given, both must be correct	1
		ii	M1	ammonia / NH_3 / molecules / they / it are / move / diffuse /travel faster / quicker	Ignore descriptions such as lighter / smaller / denser Accept phonetic spellings including amonia / ammonium Do not accept hydrogen chloride / hydrochloric acid / HCl / ammonium chloride / NH_4Cl in place of ammonia Accept all other words with same meaning as faster - eg speedier Do not accept react faster or travel further Accept reverse statements such as hydrogen chloride slower	1
	e		M1 M2	Corrosive / burns / damages skin or eyes Wear eye protection eg goggles or mask / gloves / place bung in the end of the tube / use of fume cupboard	Ignore harmful / irritant / toxic / poisonous Allow tongs / tweezers if reference to cotton wool Ignore lab coats M1 and M2 are independent	**1** **1**

Total 13 marks