Question number	Answer	Accept	Reject	Marks
1 (a) (i)	7			1
(ii)	**M1** solid			1
	M2 black	very dark grey		1
(iii)	**M1**(formula) – HAt	AtH		1
	M2 (name) – hydrogen astatide	astatine hydride	hydrogen astatine	1
(iv)	**M1** – (astatine/it/At) is less reactive (than iodine, I) **IGNORE** astatine is unreactive	iodine is more reactive reverse argument	any references to astatide or iodide	1 1
	M2 – elements get less reactive with increasing atomic number/as group is descended/the lower they are in the group	Astatine (atom) has more (electron) shells/outer shell of astatine is further from nucleus so attracts an electron less readily		1
(b) (i)	4 (1) (1) 2 (1)	multiples/halves		1
(ii)	(paper) turns white/bleaches **IGNORE** turns red	(litmus) turns colourless		1
(c) (i)	acid **IGNORE** hydrogen ions/names of acids	correct formula		1 1
(ii)	to displace (all of) the bromine / to react all of the bromide (ions)	bromine (an)ions for bromide to complete the reaction		
(iii)	$Br_2 + SO_2 + 2H_2O \rightarrow 2HBr + H_2SO_4$ **M1** all formulae correct **M2** balanced	multiples and halves		2
(iv)	$2HBr + Cl_2 \rightarrow Br_2 + 2HCl$	multiples and halves		1

(d)	**M1** colourless **IGNORE** clear/transparent/looks like water **M2** brown (solution) / (dark) grey/black <u>solid/precipitate</u>	 red-brown/orange/orange-brown	 red on its own	1 1
			Total	**16**

Question number	Answer	Notes	Marks
2 (a) (i)	7		1
(ii)	iodine / astatine	No penalty for giving both Accept formulae or symbols	1
(iii)	fluorine / chlorine	No penalty for giving both Accept formulae or symbols that clearly identify element Penalise –ide endings once only	1
(b) (i)	ions fixed/cannot move/not mobile/not free (to move) OR ions not fixed/can move/mobile/free (to move) when molten	Ignore "electrons cannot move (when solid)" Reject "electrons move (when molten)" Reject refs to atoms / molecules Ignore particles / covalent bonding	1
(ii)	because electron(s) lost (from bromide)	Reject bromine in place of bromide, but allow 'bromine ions' Ignore refs to number of electrons Assume "It" refers to bromide ions	1
(iii)	$Pb^{2+} + 2e^{(-)} \rightarrow Pb$ silver/grey/shiny (liquid)	Ignore state symbols Reject $Pb^{2+} \rightarrow Pb - 2e^{(-)}$ Ignore solid Ignore metallic No CQ from wrong product in M1	1 1

2 (c)	M1	Na Br O 2.3 8.0 4.8 23 80 16	Award 0 for whole question if division by atomic numbers / wrong way up / multiplication used If molecular masses for Br and O used, no M1, but can award M2 & M3 If one error e.g. 32 instead of 23, no M1, but can award M2 & M3	1
	M2	0.1 0.1 0.3 OR 1 1 3		1
	M3	$NaBrO_3$	Consequential on M2 Accept elements in any order Correct answer scores 3 marks Max 2 if wrong symbol used for Na (eg N, S) or Br (eg B) If one or more elements missing, only M1 can be awarded	1

Total 10 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>3 (a)</td><td>C (halogens)</td><td></td><td>1</td></tr>
<tr><td>(b) (i)</td><td>M1 <u>atoms</u> of the same element

M2 with different masses</td><td>accept ‘<u>atoms</u> with the same atomic number’ / ‘<u>atoms</u> with the same number of protons’

accept ‘different mass numbers’ / ‘different numbers of neutrons’

ignore references to electrons unless incorrect</td><td>1

1</td></tr>
<tr><td>(ii)</td><td>
<table>
<tr><th>Isotope</th><th>Number of protons</th><th>Number of neutrons</th><th>Number of electrons</th></tr>
<tr><td>$^{79}_{35}Br$</td><td>35</td><td>44</td><td>35</td></tr>
<tr><td>$^{81}_{35}Br$</td><td>35</td><td>46</td><td>35</td></tr>
</table>
</td><td></td><td>3</td></tr>
</table>

	M1 first column correct **M2** second column correct M3 third column correct		
(c)	ethane – no change (in colour) ethene – (orange to) colourless / decolourises	accept '(stays) orange' ignore 'no reaction' /'nothing happens' ignore 'discolours' ignore starting colour of bromine	1 1

4	a	i		C		1
		ii		B		1
	b			fluorine / F_2	Accept F	1
	c	i		hydrogen chloride		1
		ii		hydrochloric (acid)		1
		iii		HCl		1
					Total	**6**

Question number				Answer	Notes	Marks
5	a	i	M1	Chlorine / $/Cl_2$	Allow Cl Accept phonetic spellings Do not penalise poorly written formulae such as CL / cl / cL	1
			M2	Iodine / I_2	Allow I Accept phonetic spellings	1
		ii	M1	Astatine / At_2	Allow At Accept phonetic spellings Do not penalise poorly written formulae such as AT / at / aT	1
	b		M1 M2	$H_2 + Cl_2 \rightarrow 2HCl$	correct formulae = 1 balancing = 1 Max 1 for symbol or formula error, eg HcL, Cl^2	1 1

Question number				Answer	Notes	Marks
5	c	i	M1	red		1
			M2	(hydrochloric) acid / hydrogen ions / H^+ (formed)	Ignore acidic and references to pH	1
		ii	**M1**	b	Allow no colour change Do not accept changes (from red) to blue	1
			M2	no reaction/acid/hydrogen ions/H^+ (formed)	Reject any reference to alkaline Ignore not acidic and references to pH Ignore reference to not dissolving	1

Total 9 marks