

Question number	Answer	Accept	Reject	Marks
1 (a) (i)	7			1
(ii)	M1 solid M2 black	<u>very</u> dark grey		1 1
(iii)	M1 (formula) – HAt M2 (name) – hydrogen astatide	AtH astatine hydride	hydrogen astatide	1 1
(iv)	M1 – (astatine/it/At) is less reactive (than iodine, I) IGNORE astatine is unreactive M2 – elements get less reactive with <u>increasing</u> atomic number/as group is <u>descended</u> /the lower they are in the group	<u>iodine</u> is more reactive reverse argument Astatine (atom) has more (electron) shells/outer shell of astatine is further from nucleus so attracts an <u>electron</u> less readily	any references to astatide or iodide	1 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
(ii)	to displace (all of) the <u>bromine</u> / to react all of the <u>bromide</u> (ions)	bromine (an) <u>ions</u> for bromide to complete the reaction		1
(iii)	$\text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{HBr} + \text{H}_2\text{SO}_4$ M1 all formulae correct M2 balanced	multiples and halves		2
(iv)	$2\text{HBr} + \text{Cl}_2 \rightarrow \text{Br}_2 + 2\text{HCl}$	multiples and halves		1

(d)	M1 colourless IGNORE clear/transparent/looks like water			1
	M2 brown (solution) / (dark) grey/black <u>solid/precipitate</u>	red- brown/orange/orange- brown	red on its own	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) $\text{Pb}^{2+} + 2\text{e}^{(-)} \rightarrow \text{Pb}$ silver/grey/shiny (liquid)	Ignore state symbols Reject $\text{Pb}^{2+} \rightarrow \text{Pb} - 2\text{e}^{(-)}$ Ignore solid Ignore metallic No CQ from wrong product in M1	1 1

2 (c) M1	<table style="margin-left: auto; margin-right: auto;"> <tr> <td>Na</td> <td>Br</td> <td>O</td> </tr> <tr> <td>$\frac{2.3}{23}$</td> <td>$\frac{8.0}{80}$</td> <td>$\frac{4.8}{16}$</td> </tr> </table>	Na	Br	O	$\frac{2.3}{23}$	$\frac{8.0}{80}$	$\frac{4.8}{16}$	<p>Award 0 for whole question if division by atomic numbers / wrong way up / multiplication used</p> <p>If molecular masses for Br and O used, no M1, but can award M2 & M3</p> <p>If one error e.g. 32 instead of 23, no M1, but can award M2 & M3</p>	1			
Na	Br	O										
$\frac{2.3}{23}$	$\frac{8.0}{80}$	$\frac{4.8}{16}$										
M2	<table style="margin-left: auto; margin-right: auto;"> <tr> <td>0.1</td> <td>0.1</td> <td>0.3</td> </tr> <tr> <td>OR</td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>1</td> <td>3</td> </tr> </table>	0.1	0.1	0.3	OR			1	1	3		1
0.1	0.1	0.3										
OR												
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M3	NaBrO ₃	<p>Consequential on M2</p> <p>Accept elements in any order</p> <p>Correct answer scores 3 marks</p> <p>Max 2 if wrong symbol used for Na (eg N, S) or Br (eg B)</p> <p>If one or more elements missing, only M1 can be awarded</p>	1									

Total 10 marks

Question number	Answer	Notes	Marks												
3 (a)	C (halogens)		1												
(b) (i)	<p>M1 <u>atoms</u> of the same element</p> <p>M2 with different masses</p>	<p>accept '<u>atoms</u> with the same atomic number' / '<u>atoms</u> with the same number of protons'</p> <p>accept 'different mass numbers' / 'different numbers of neutrons'</p> <p>ignore references to electrons unless incorrect</p>	1 1												
(ii)	<table border="1"> <thead> <tr> <th>Isotope</th> <th>Number of protons</th> <th>Number of neutrons</th> <th>Number of electrons</th> </tr> </thead> <tbody> <tr> <td>${}^{79}_{35}\text{Br}$</td> <td>35</td> <td>44</td> <td>35</td> </tr> <tr> <td>${}^{81}_{35}\text{Br}$</td> <td>35</td> <td>46</td> <td>35</td> </tr> </tbody> </table>	Isotope	Number of protons	Number of neutrons	Number of electrons	${}^{79}_{35}\text{Br}$	35	44	35	${}^{81}_{35}\text{Br}$	35	46	35		3
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${}^{79}_{35}\text{Br}$	35	44	35												
${}^{81}_{35}\text{Br}$	35	46	35												

	M1 first column correct M2 second column correct M3 third column correct		
(c)	ethane – no change (in colour)	accept '(stays) orange' ignore 'no reaction' /'nothing happens'	1
	ethene – (orange to) colourless / decolourises	ignore 'discolours' ignore starting colour of bromine	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	M 1	Chlorine / Cl_2	Allow Cl Accept phonetic spellings Do not penalise poorly written formulae such as CL / cl / cL	1
			M 2	Iodine / I_2	Allow I Accept phonetic spellings	1
		ii	M 1	Astatine / At_2	Allow At Accept phonetic spellings Do not penalise poorly written formulae such as AT / at / aT	1
	b		M 1 M 2	$\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$	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	Ignore acidic and references to pH	1
			M2	(hydrochloric) acid / hydrogen ions / H ⁺ (formed)		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