

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 astatine	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)	multuples/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 bromine / to react all of the bromide (ions)	bromine (an)ions 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	multuples and halves		2
(iv)	$2\text{HBr} + \text{Cl}_2 \rightarrow \text{Br}_2 + 2\text{HCl}$	multuples 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
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Question number			Answer	Notes	Marks
1	a		B (red-brown liquid)		1
	b		2 (1) 2	Accept multiples and fractions	1
	c	i	a halogen/an element cannot displace itself OR no reaction / no displacement (would occur)	Accept a halogen does not react with <u>its own</u> (halide) ions Accept correct reference to a specific halogen/halide ion Accept nothing happens Reject any references to a halogen having the same reactivity as a halide (ion)	1
		ii	a halogen cannot displace a more reactive halogen OR a halogen cannot react with the (halide) ions of a more reactive halogen	Reject any references to a halogen having a different reactivity to a halide (ion) Accept correct reference to a specific halogen/halide ion	1
		iii	potassium bromide	Ignore any formula Reject any other species with corrected name	1

Question number				Answer	Notes	Marks
1		iv	M1	(correct products) KCl AND I ₂	Accept in either order	
			M2	2 2	M2 DEP on M1	
	c	v		(both) reduction <u>AND</u> oxidation occur (in the same reaction)	Accept (both) gain <u>AND</u> loss of electrons occurs (in the same reaction) Accept (both) gain <u>AND</u> loss of oxygen occurs (in the same reaction) Accept (both) increase <u>AND</u> decrease of oxidation states/oxidation numbers (in the same reaction) Ignore incorrect species being oxidised and reduced / losing and gaining electrons	1

		vi	M1	(species) I^- / iodide (ion)		1
			M2	(reason) loss of electron(s)	Accept increase in oxidation number OR oxidation number changes from –1 to 0 Ignore number of electrons lost M2 DEP on M1 correct, or near miss e.g. iodine	1
					Total 10 marks	

Question number	Answer	Notes	Marks									
2 a	<table><tr><th>Halogen</th><th>Colour</th><th>Physical state</th></tr><tr><td>bromine</td><td></td><td>liquid</td></tr><tr><td>iodine</td><td>black</td><td></td></tr></table>	Halogen	Colour	Physical state	bromine		liquid	iodine	black		M1 (bromine) liquid / (l) M2 (iodine) black allow (dark) grey	2
Halogen	Colour	Physical state										
bromine		liquid										
iodine	black											
b	<pre> •• xx •• : Br x P x Br : •• x• •• : Br : ••</pre>	M1 three bonding pairs of electrons correct M2 rest of electrons correct Accept any combination of dots and crosses Ignore circles	2									
c	$\text{PBr}_3 + 3\text{H}_2\text{O} \rightarrow 3\text{HBr} + \text{H}_3\text{PO}_3$	M1 all formulae correct M2 balanced M2 DEP on M1	2									
Total 6 marks												