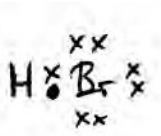
Question number				Answer	Notes	Marks
1	a	i	M1	35 on lines 1 and 3		1
			M2	44 on line 2		1
		ii		isotopes		1
		iii		same number of electrons (in outer shell) OR same electron arrangement or configuration	Ignore references to protons and neutrons unless incorrect, eg different numbers of protons, same number of neutrons	1
		iv	M1	^{79}Br	Accept just 79	1
			M2	79 is closer to 79.9/more accurate value	Accept 79 is closer to relative atomic mass M2 dependent on M1	1

Question number				Answer	Notes	Marks
1	b	i	M1		shared pair of electrons	1
			M2		other electrons correct (not necessary to be paired)	1
					M2 dependent on M1 Accept any combinations of dots and crosses Circles not needed but if drawn must overlap or touch – if not, then 0/2 Ignore inner electron shells even if incomplete or incorrect	
					Do not penalise incorrect symbols, eg br/BR If Na used in place of H, max 1 No marks if ions shown	
		ii	M1	shared (two/pair of) electrons	Not share an electron	1
			M2	attracted to <u>both</u> nuclei	M2 dependent on M1 or near miss eg the electrons are attracted to the nucleus scores 0 the electrons are attracted to both nuclei scores M2 but not M1	1
					0/2 if references to ions / ionic bond / intermolecular forces	

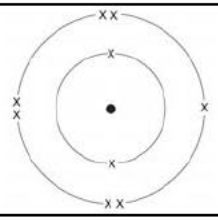
Question number				Answer	Notes	Marks
1	b	iii	M1	(sodium bromide) ionic bonding / + and – ions	Reject covalent bonding / shared electrons	1
			M2	(hydrogen bromide) attraction between molecules / intermolecular forces (of attraction)	Accept dipole-dipole attractions / van der Waals' forces / IMF / vdW Ignore hydrogen bonds Reject ions/ionic	1
			M3	ionic bonding stronger OR IMF / attractions between HBr molecules weaker	Accept ionic bonds stronger M3 dependent on comparison of intermolecular forces and ionic bonding Accept correct references to energy needed to overcome bonding / attractions	1
					Ignore references to reactivity and mass	

Question number		Answer			Notes	Marks
1 c	M1	Na 13.8 23	Br 47.9 80	O 38.3 16	0/3 if division by atomic number(s) /division wrong way round If only two elements shown correctly, only M1 can be awarded	1
	M2	0.6	0.6	2.4	Accept 1 : 1: 4	1
	M3	$NaBrO_4$			Accept elements in any order Penalise M3 for incorrect symbol, eg $SBrO_4$ or $NaBO_4$	1
					Dividing by 160 instead of 80 gives Na2BrO8 Dividing by 32 instead of 16 gives NaBrO2 Award 2 in these cases Both these errors give Na2BrO4 Award 1 in this case	
					Correct final answer scores 3 marks	
					Total	**16**

Question number	Answer	Accept	Reject	Marks
2 (a) (i)	B	lower case letters		1
(ii)	D			1
(iii)	A			1
(iv)	C			1
(b)	**M1 -** (a substance) containing (two or more) element<u>s</u> IGNORE atoms for **M1** only		mixture for M1 only	1
	M2 – bonded (together) /<u>chemically</u> combined (in a fixed ratio)	<u>chemically</u> joined	molecules/particles bonded, etc for M1 and M2	1
(c) (i)	**M1** - Na loses electron(s)			1
	M2 – Cl gains electron(s)			1
	M3 – Na becomes 2.8 AND chlorine becomes 2.8.8 If incorrect number of electrons transferred, max 2 IGNORE references to full shells max 1 for mention of covalent bonding All 3 marks can be scored from correct dot and cross diagram<u>s</u> showing electron transfer			1

(ii)	**M1** – Na = 23 AND Cl = 35.5 **M2 –** 58.5 **M2** dep on **M1** **IGNORE units** **Correct answer with no working scores 2**			1 1

(Total marks for Question 2 = 11 marks)

Question number	Answer	Notes	Marks
3 (a) (i)	A (Ag)		1
(ii)	D (Zr)		1
(b) (i)	3		1
(ii)	(The atom has) three <u>electrons</u> in its outer / valence shell	'energy level' for 'shell' ignore references to inner shells ignore 'it has a valency of 3'	1
(iii)	3		1
(iv)	(The atom has) electrons in three shells / three shells are occupied (with electrons)	'energy levels' for 'shells' accept 'it has three shells'	1
(v)	aluminium / Al		1
(c)		accept any symbol for electrons, eg dots, the letter 'e'	1

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>4 (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

Question number	Answer	Notes	Marks
5 a	C (lithium reacts with water to form an alkali)		1
b	A (have the same number of outer shell electrons)		1
c	(similar) bubbles / fizzing / effervescence OR moves / darts / floats OR gets smaller / disappears potassium shows a flame / sparks / explodes OR potassium melts / forms ball	Accept gas given off /evolved/formed/produced Accept hydrogen gas Ignore identity of gas Accept dissolves Accept reverse arguments for lithium	1 1
d	K_2O KCl	Accept K_2O_2 and KO_2 Reject KO If formula shown as product of an equation, ignore reactants and balancing Ignore coefficients	1 1
e	s l aq g		1
f	85 AND 87 calculated (even if not identified) (85 × 0.72) + (87 × 0.28) = 85.6	Accept 37+48 and 37+50 Correct final answer = 2 marks 85.5 or 85.56 = 1 mark No ECF from incorrect mass numbers Ignore units	1 1
			Total 9 marks