

Question number	Answer	Additional guidance	Mark
1(a)	An answer that combines the following points of understanding to provide a logical description: <ul style="list-style-type: none"> <li>• (hydrogen produced as a gas so) there would be {effervescence/fizzing/bubbles} (1)</li> <li>• and (calcium hydroxide produced as a solid so) the water would go {cloudy/a white precipitate would form} (1)</li> </ul>	Allow: calcium moves (around) (1) calcium decreases in size/disappears/dissolves (1)	(2)

Question number	Answer	Mark
1(b)	$\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$ <ul style="list-style-type: none"> <li>• LHS (1)</li> <li>• RHS (1)</li> </ul>	(2)

Question number	Answer	Additional guidance	Mark
1(c)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): <ul style="list-style-type: none"> <li>• In calcium the outermost electron(s) {are further away from nucleus /experience(s) greater shielding} (from the nucleus) (as shown by the electronic configuration) (1)</li> <li>• Therefore less attraction between nucleus and electron(s)/ the electron(s) is/are easier to remove (1)</li> </ul>	Allow answers in terms of why reactivity of magnesium is less than that of calcium	(2)

Question number	Answer	Additional guidance	Mark
<b>1(d)</b>	<ul style="list-style-type: none"> <li>• divides mass by relative atomic mass (1)</li> <li>• calculates simplest ratio (1)</li> <li>• expresses ratio correctly as empirical formula (1)</li> </ul>	<p>Example of calculation</p> <p>Ca : Br</p> $\frac{0.2}{40} : \frac{0.8}{80}$ $0.005 : 0.01$ $1 : 2$ <p>empirical formula CaBr<sub>2</sub></p> <p>Formula alone scores max 1</p>	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(i)</b>	A, B and C	Mg Ca Au (any order) magnesium calcium gold (any order)	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(ii)</b>	A and B	Mg Ca (any order) magnesium calcium (any order)	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)</b>	8 (protons)		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(c)(i)</b>	A : 10		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(c)(ii)</b>	(in 100 atoms)  mass of mass number 20 atoms = 20 x 90 (1) mass of mass number 22 atoms = 22 x 10 (1) relative atomic mass = $\{(22 \times 10) + (20 \times 90)\} / 100$ (=20.2) (1)  OR  20 contributes = 90/100 x 20 (1) 22 contributes = 10/100 x 22 (1) relative atomic mass = 90/100 x 20 + 10/100 x 22 (= 20.2) (1)	20.2 = 3 marks  21.8 = 2 marks (only 1 error made)	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(d)</b>	An explanation linking any two of (the element is) group 0 / noble gas / unreactive / inert / does not react (1) { (has) 8 electrons / full } outer shell (1) prevents filament from reacting (1)	ignore 'not very reactive'  does not {gain / lose / share} electrons	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)</b>	<p>An explanation including the following points</p> <ul style="list-style-type: none"> <li>metal (1)</li> <li>because {on left of / below} the line dividing metals and non-metals/because boron only non-metal in group 3 (1)</li> </ul>	<p>correct statement relating to neighbouring metallic elements surrounded by metals</p>	<b>(2)</b>

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<b>3(b)</b>	2.8.3	283	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(i)</b>	A five protons		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(ii)</b>	<p>An explanation including the following points</p> <ul style="list-style-type: none"> <li>atoms of same element / same {number of protons / atomic number} (1)</li> <li>different {numbers of neutrons / mass numbers} (1)</li> </ul>	ignore electrons	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(iii)</b>	more atoms have mass 11 (than 10) / ORA	boron 11 isotope more abundant OWTE	<b>(1)</b>

Question Number	Answers	Acceptable Answers	Mark			
<b>4 (a)</b>		relative mass	relative charge	position in atom	ignore units reject relative mass of proton: +1/1+  for relative mass of electron: anything smaller than 1/1500/0.00067 (almost) 0/negligible/very small  for relative charge on neutron: none/no charge/neutral  for position of electron in an atom: in orbits / orbitals / energy levels / around the nucleus / outside the nucleus ignore rings ignore inner/outer	
	proton	<b>1</b>	(+1)	<b>in nucleus</b>		
	neutron	(1)	<b>0</b>	(in nucleus)		
	electron	<b>1/1837</b>	<b>-1</b>	<b>in shells</b>		
	all 6 correct (3) 4 or 5 correct (2) 2 or 3 correct (1)					

Question Number	Answers	Acceptable Answers	Mark
<b>4 (b)</b>	D equal numbers of protons and electrons		<b>(1)</b>

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<b>4 (c) (i)</b>	Ca	Reject CA / ca /cA ignore calcium	<b>(1)</b>

Question Number	Answers	Acceptable Answers	Mark
<b>4 (c) (ii)</b>	O	ignore any negative charge on the O ignore oxygen reject: oxide/O <sub>2</sub>	<b>(1)</b>

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<b>4 (d)(i)</b>	13	Allow correct working even if wrong answer	<b>(1)</b>

Question Number	Answers	Acceptable Answers	Mark
<b>4 (d)(ii)</b>	<b>D AIN</b>		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(i)</b>	C T		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(ii)</b>	C Q and S		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)(i)</b>	number of protons (in nucleus of atom)	ignore number of electrons eg number of protons and electrons worth (1)	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)(ii)</b>	An explanation including <ul style="list-style-type: none"> <li>(atoms of) both contain 5 /same number of protons/same atomic number (1)</li> <li>boron-10 atoms contain 5 neutrons but boron-11 atoms contain 6 neutrons / different numbers of neutrons/ different mass number (1)</li> </ul>	ignore electrons  boron-11 atoms contain 1 more neutron / boron-10 atoms contain 1 less neutron	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(c)(i)</b>	An explanation including the following <ul style="list-style-type: none"> <li>M1 {average/mean} mass (of atoms of an element) (1)</li> <li>M2 compared to {1/12 mass carbon-12 (atom)/ (mass of carbon-12 (atom) taken as 12} (1)</li> </ul>	For M1 reject weight reject if mass of molecule reject if mass of neutrons and protons  any reference to carbon-12 scores mark	<b>(2)</b>



Question Number	Answer	Acceptable answers	Mark
<b>5(c)(ii)</b>	$[19.7 \times 10] (1) + [80.3 \times 11] (1)$ $/100 (1) (=10.8)$  $[0.197 \times 10] (1) + [0.803 \times 11] (1) =$ $[1.97 + 8.83] (1) (=10.8)$	If no working shown 10.8(03) worth 3 marks	<b>(3)</b>