

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

Question number	Answer	Additional guidance	Mark
1(c)	<p>An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):</p> <ul style="list-style-type: none"> • 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) • Therefore less attraction between nucleus and electron(s)/ the electron(s) is/are easier to remove (1) 	<p>Allow answers in terms of why reactivity of magnesium is less than that of calcium</p>	(2)

Question number	Answer	Additional guidance	Mark
1(d)	<ul style="list-style-type: none"> • divides mass by relative atomic mass (1) • calculates simplest ratio (1) • expresses ratio correctly as empirical formula (1) 	<p><u>Example of calculation</u></p> <p>Ca : Br</p> $\frac{0.2}{40} : \frac{0.8}{80}$ $0.005 : 0.01$ $1 : 2$ <p>empirical formula CaBr_2</p> <p>Formula alone scores max 1</p>	(3)

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

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

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

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	A : 10		(1)

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

Question Number	Answer	Acceptable answers	Mark
2(d)	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	(2)

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

Question Number	Answer	Acceptable answers	Mark
3(b)	2.8.3	283	(1)

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	A five protons		(1)

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

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

Question Number	Answers	Acceptable Answers	Mark			
4 (a)		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	1	(+1)	in nucleus		
	neutron	(1)	0	(in nucleus)		
	electron	1/1837	-1	in shells		
	all 6 correct (3) 4 or 5 correct (2) 2 or 3 correct (1)					

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

Question Number	Answers	Acceptable Answers	Mark
4 (c)(i)	Ca	Reject CA / ca /cA ignore calcium	(1)

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

Question Number	Answers	Acceptable Answers	Mark
4 (d)(i)	13	Allow correct working even if wrong answer	(1)

Question Number	Answers	Acceptable Answers	Mark
4 (d)(ii)	D AIN		(1)

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	C T		(1)

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

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

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

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

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