Question number	Answer	Additional guidance	Mark
1(a)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • a negative ion must have more electrons than protons in the particle (1) • therefore Z will have a 2– charge (1)	Do not allow any comparison involving neutrons.	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)	40 + 2 × (14 + 16 × 3) (1) = 164 (1)	Award full marks for correct numerical answer without working.	**(2)**

Question number	Answer	Mark
1(c)	• Li ion with empty outer shell (1) • 1+ charge on Li (1) • 8 electrons on outer shell of F (1) • 1– charge on F (1)	**(4)**

Question Number	Answer	Acceptable answers	Mark
2(a)	D : $Ca(NO_3)_2$		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	C : 8		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)	Description including four of the following sodium - 2.8.1 / 1 electron in outer shell (1) sodium (atoms) lose electrons (1) one per atom (1) (forms) Na^+ (1) sulphur - 2.8.6 / 6 electrons in outer shell (1) sulfur (atoms) gain electrons (1) two per atom (1) (forms) S^{2-} (1) two sodium atoms / ions combine with one sulfur atom / ion (1) formula is Na_2S (1)	Marks can be gained using diagrams mention of shared electrons / covalent bonding in words or diagram = max 2 marks	**(4)**

Question Number		Indicative Content	Mark
QWC	***2(d)**	A description including some of the following points **solid** {regular arrangement/ lattice} (of ions) sodium/Na^+ ions chloride /Cl^- ions (held together by) strong (ionic) bonds strong (electrostatic) forces of attraction between oppositely charged ions / positive and negatively charged ions closely packed together (when solid) does not conduct because ions cannot move **molten** heat energy {overcomes/breaks} (strong ionic) bonds strong (electrostatic) forces of attraction between oppositely charged ions / positive and negatively charged ions ions can move (therefore) conducts when molten	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	a limited explanation e.g. does not conduct when solid e.g. does conduct when molten the answer communicates ideas using simple language and uses limited scientific terminology spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	a simple explanation e.g. does not conduct when solid, does conduct when molten because {ions / particles / atoms} can move the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	a detailed explanation e.g. solid has strong ionic bonds (between oppositely charged ions), does not conduct when solid because ions cannot move, does conduct when molten because ions can move the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	<table><tr><th>particle</th><th>number</th></tr><tr><td>proton</td><td>29</td></tr><tr><td>neutron</td><td>34</td></tr><tr><td>electron</td><td>29</td></tr></table> all 3 correct **(2)** any 1 or 2 correct **(1)**		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	(copper atom has) 4 (shells of electrons)	Do not allow 4 electrons on the outer shell Do not allow 4 outer shells	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	An explanation linking • atoms of the (same) element/ atoms with the same {number of protons/atomic number} **(1)** • (but) different {numbers of neutrons/mass numbers} **(1)**	Maximum **(1)** if no mention of atom(s)/atomic Allow the marks if a specific example is given e.g. all chlorine atoms have 17 protons **(1)** but some have 18 neutrons and others have 20 neutrons **(1)** Ignore any reference to numbers of electrons Ignore different forms of an element Allow {more/less} neutrons than the {usual/original} atom **(1)** Do not allow more neutrons than protons Do not allow different (relative) atomic masses	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iv)	• (in 100 atoms) mass of copper-63 atoms = 63 x 70 / 63 x 0.7 / 63 x 7 **(1)** (= 4410 / 44.1 / 441) • mass of copper-65 atoms = 65 x 30 / 65 x 0.3 / 65 x 3 **(1)** (= 1950 / 19.5 / 195) • relative atomic mass = $\frac{(63 \times 70 + (65 \times 30)}{100}$ / $\frac{4410 + 1950}{100}$ 44.1 + 19.5/ $\frac{441+ 195}{10}$ **(1)** (= 63.6)	63.6 with no working **(3)** 63.5/64 with no working **(0)** Allow correct working shown to calculate 63.6 then final answer is rounded to 64 **(3)** Note: correct working shown to calculate 63.6 then final answer is incorrectly rounded to 63.5/63 **(2)** Ignore any unit e.g. g Allow TE for third mark e.g if percentages used the wrong way round 64.4 scores **(1)**	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	• two electrons/ $2e^{(-)}$ **(1)** • {loses/gives away} electrons **(1)**	Reject any reference to a covalent bond or sharing electrons (0) $Cu \rightarrow Cu^{2+} + 2e^{(-)}$ **or** $Cu - 2e^{(-)} \rightarrow Cu^{2+}$ **(2)** Allow +2 for charge Allow transfers electrons to another atom **(1)** Allow electrons taken away **(1)** Ignore electrons are missing Ignore references to the nitrate ion/other non-metals Ignore references to full outer shell	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	$Cu(NO_3)_2$	Formula must be totally correct including subscripts, letter case and brackets Allow $Cu^{2+}(NO_3^-)_2$ Ignore any balancing numbers in front of formula Ignore any working/attempted equation to find the formula	**(1)**