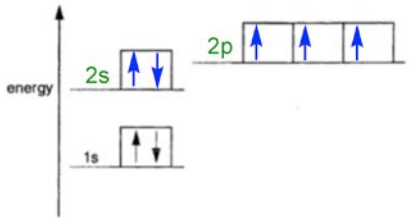
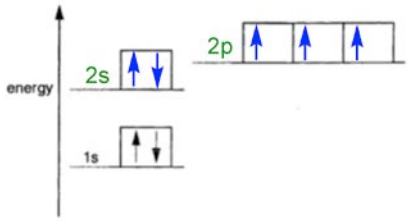
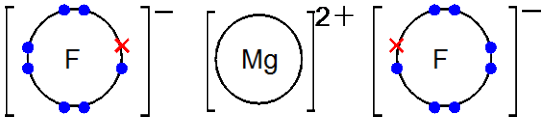
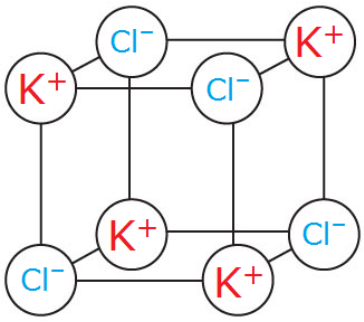
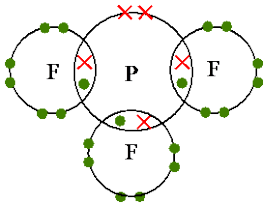
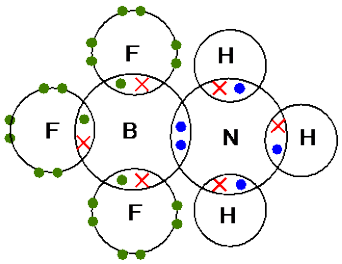
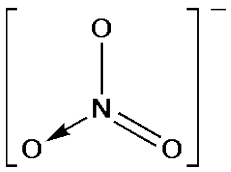
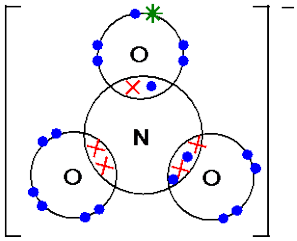
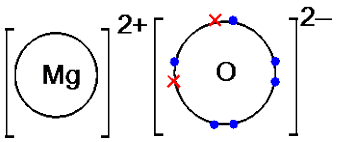
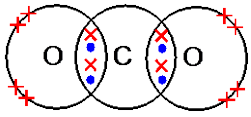
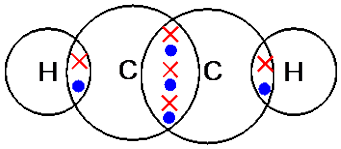
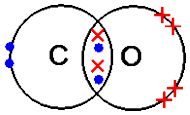
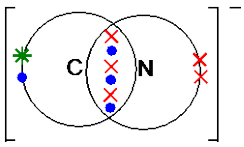
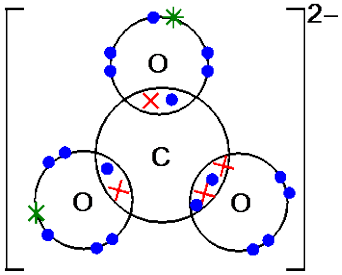
Question number	Answer	Marks	Guidance
1 (a)	Li^+ and P^{3-}, Li_3P	B1	
1 (b)	Li^+ and PO_4^{3-}, Li_3PO_4	B1	
1 (c)	Cr^{3+} and OH^-, $Cr(OH)_3$	B1	
1 (d)	Fe^{3+} and Se^{2-}, Fe_2Se_3	B1	
1 (e)	Ti^{3+} and N^{3-}, TiN	B1	
1 (f)	Ba^{2+} and SO_4^{2-}, $BaSO_4$	B1	
1 (g)	Ba^{2+} and SO_3^{2-}, $BaSO_3$	B1	
1 (h)	Ni^{2+} and MnO_4^-, $Ni(MnO_4)_2$	B1	
2 (a)	Orbital is a region around the nucleus that can hold up to two electrons, with opposite spins	B1	
2 (b) (i)	2	B1	
2 (b) (ii)	10	B1	
2 (b) (iii)	32	B1	
2 (c) (i)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$	B1	
2 (c) (ii)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7\ 4s^2$	B1	
2 (d) (i)	Arrows correct	B1	
2 (d) (ii)	2s and 2p labels	B1	

Question number	Answer	Marks	Guidance
2 (e) (i)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$	B1	
2 (e) (ii)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}$	B1	
2 (f) (i)	2	B1	
2 (f) (ii)	14	B1	
2 (f) (iii)	3	B1	
3 (a)	Electrostatic attraction between oppositely charged ions	B1	
3 (b)	 1 mark for Dot and cross 1 mark for Ionic charges	B1 × 2	
3 (c) (i)	giant ionic lattice	B1	
3 (c) (ii)	 1 mark for K and Cl arranged correctly 1 mark for K and Cl shown as ions: K^+ and Cl^-	B1 × 2	
3 (d)	In the solid state, the ions cannot move as they are fixed in a giant ionic lattice structure In solution, ions are free to move and carry charge	B1 B1	
3 (e)	As ionic charge increases, melting point increases.	B1	

Question number	Answer	Marks	Guidance
	The greater the ionic charge, the greater the attraction between ions and the more energy required to break the ionic bonds	B1 B1	
4 (a)		B1	
4 (b) (i)	A dative covalent bond is a shared pair of electrons where both electrons are from the same atom	B1	
4 (b) (ii)	 1 mark for dot and cross for B and 3Fs correct 1 mark for dot and cross around N correct including dative covalent bond	B1 × 2	
4 (c) (i)		B1	
4 (c) (ii)	 1 mark for dot and cross around N atom 1 mark for dot and cross around N correct including one extra electron	B1 × 2	

Question number	Answer	Marks	Guidance
4 (d)	NH_4^+ NO_3^-	B1 B1	
5 (a)	 1 mark for Dot and cross 1 mark for Ionic charges	B1 × 2	
5 (b)	Magnesium oxide has a giant ionic lattice Strong bonding between 2+ and 2– ions A large amount of energy is needed to break ionic bonding	B1 B1 B1	
5 (c) (i)	In the solid state, the ions cannot move as they are fixed in a giant ionic lattice structure In solution, ions are free to move and carry charge	B1 B1	
5 (c) (ii)	$MgO(s) + 2HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + H_2O(l)$	B2	
5 (c) (iii)	Mg^{2+} NO_3^-	B1 B1	
6 (a)		B1	
6 (b) (i)	2 lone pairs, 1 dative covalent bond	B1	
6 (b) (ii)	A covalent bond is the strong electrostatic attraction between a shared pair of electrons and the nuclei of the bonded atoms	B1	
6 (b) (iii)	A dative covalent bond is a shared pair of electrons where both electrons are from the same atom	B1	

Question number	Answer	Marks	Guidance
6 (c)		B1	
6 (d) (i)		B1	
6 (d) (ii)	There are only 6 electrons surrounding the carbon atom	B1	
6 (e) (i)		B1	
6 (e) (ii)	CO and CN^- have the same number of electrons	B1	
6 (f)	 1 mark for dot and cross around C atom 1 mark for dot and cross around Os correct including 2 extra electron	B1 × 2	