Mark Scheme

Q1.

Question Number	Answer	Mark
	The only correct answer is C (poor electrical conductivity) ***A*** *is not correct because both graphene and graphite are similar to diamond in having a high melting temperature* ***B*** *is not correct because neither graphene nor graphite nor diamond have a precise molecular formula since they are giant molecular structures* ***C*** *is not correct because graphene, graphite and diamond are all giant molecular structures*	**(1)**

Q2.

Question number	Answer	Mark
(i)	**The only correct answer is C** (graph C) ***A*** *is incorrect because HF has a much higher boiling temperature than expected due to hydrogen bonding* ***B*** *is incorrect because these is an increase in boiling temperature from HCl to HI as the number of electrons in the molecules increases so the London forces increase in strength* ***D*** *is incorrect because HBr has a higher boiling temperature than HCl as there are more electrons in the molecules*	**(1)**

Question number	Answer	Mark
(ii)	**The only correct answer is A** (acid-base) ***B*** *is incorrect there is no displacement taking place* ***C*** *is incorrect because neither substance is oxidised or reduced* ***D*** *is incorrect because there is no substitution taking place*	**(1)**

Q3.

Question Number	Answer	Mark
	The only correct answer is C (hexagonal rings within a layer) ***A*** *is not correct because in the layers of graphite and graphene the carbon atoms are bonded to three other carbon atoms and not four* ***B*** *is not correct because graphite and graphene do not have pentagonal rings within their layers* ***D*** *is not correct because graphene is a two-dimensional structure consisting of a single layer*	**(1)**

Q4.

Question Number	Answer	Mark
	The only correct answer is D ***A*** *is not correct because this is approximately the angle given in the diagram* ***B*** *is not correct because this is the angle for three bonds when there is also a lone pair on the central atom* ***C*** *is not correct because this is the angle when there are four pairs of bonding electrons around the central atom*	**(1)**

Q5.

Question Number	Answer	Mark
	The only correct answer is A ***B*** *is not correct because fluorine is very electronegative and has a suitable lone pair of electrons for hydrogen bonding.* ***C*** *is not correct because has hydrogen bonding; compare with water.* ***D*** *is not correct because alcohols can hydrogen bond; compare with water.*	**(1)**

Q6.

Question Number	Answer	Mark
	The only correct answer is C ***A*** *is not correct because it has a similar shape to water.* ***B*** *is not correct because it has a trigonal planar shape; resulting from the lone pair and two groups of electrons in the two double bonds.* ***D*** *is not correct because it is planar but not linear.*	**(1)**

Q7.

Question Number	Answer	Mark
	The only correct answer is B ***A*** *is incorrect because covalent bonds are within molecules not between molecules* ***C*** *is incorrect because there are no ionic bonds* ***D*** *is incorrect because London forces are not the strongest force*	**(1)**

Q8.

Question Number	Answer	Mark
(i)	**The only correct answer is D** ($Br^{+}(g) - e^{-} \rightarrow Br^{2+}(g)$) **A** *is not correct because* $Br(g) + e^{-} \rightarrow Br^{-}(g)$ *is an equation for first electron affinity* **B** *is not correct because* $Br^{-}(g) + e^{-} \rightarrow Br^{2-}(g)$ *is an equation for second electron affinity* **C** *is not correct because* $Br(g) - 2e^{-} \rightarrow Br^{2+}(g)$ *is an equation that combines first and second ionisations*	**(1)**

Question Number	Answer	Mark
(ii)	**The only correct answer is B** (801, 2 427, 3 660, 25 026, 32 828) **A** *is not correct because* 738, 1 451, 7 733, 10 541, 13 629 *is typical of Group 2 elements* **C** *is not correct because* 1 086, 2 353, 4 621, 6 223, 37 832 *is typical of Group 4 elements* **D** *is not correct because* 1 402, 2 856, 4 578, 7 475, 9 445 *could be for Group 5, 6, 7, 8 or transition elements*	**(1)**

Q9.

Question Number	Answer	Mark
	The only correct answer is D (Na^+ and Mg^{2+}) **A** *is not correct because the chloride ion has an extra shell of electrons compared to the nitride ion* **B** *is not correct because the sulfide ion has an extra shell of electrons compared to the oxide ion* **C** *is not correct because the potassium ion has an extra shell of electrons compared to the sodium ion*	**(1)**

Q10.

Question Number	Answer	Mark
	The only correct answer is A *B is not correct because oxygen has more protons to exert an attractive force to reduce the ionic radius* *C is not correct because sodium has more protons to exert an attractive force to reduce the ionic radius* *D is not correct because aluminium has more protons to exert an attractive force to reduce the ionic radius*	**(1)**

Q11.

Question number	Answer	Mark
	The only correct answer is A (anions and cations) ***B*** *is incorrect because ionic bonding involves positive ions and negative ions* ***C*** *is incorrect because there are no delocalised electrons in ionic bonding* ***D*** *is incorrect because this is a description of covalent bonding*	**(1)**

Q12.

Question number	Answer	Mark
(i)	**The only correct answer is D** (Substance **S**) ***A*** *is incorrect because copper exists as a giant metallic lattice* ***B*** *is incorrect because iodine exists as a simple molecular lattice* ***C*** *is incorrect because silicon(IV) oxide exists as a giant covalent lattice*	**(1)**

Question number	Answer	Mark
(ii)	**The only correct answer is A** (Substance **P**) ***B*** *is incorrect because iodine has a low melting temperature and does not conduct electricity* ***C*** *is incorrect because silicon(IV) oxide does not conduct electricity* ***D*** *is incorrect because sodium chloride does not conduct electricity when solid*	**(1)**

Q13.

Question Number	Answer	Mark
	A (giant ionic)	**(1)**

Q14.

Question Number	Answer	Mark
	The only correct answer is D (all 120°) ***A*** *is not correct because the angles within a layer of graphite and graphene are neither 90° nor 109.5° but are all 120°* ***B*** *is not correct because the angles within a layer of graphite and graphene are not 109.5° but are all 120°* ***C*** *is not correct because there are no angles within a layer of graphite and graphene that are 109.5° but they are all 120°*	**(1)**