MARKSCHEME - SL BONDING

P1A Answer Key:

1.B, 2.B, 3.C, 4.B, 5.C, 6.B, 7.C, 8.A, 9.B, 10.C, 11.C, 12.B, 13.B, 14.C, 15.D, 16.A, 17.C, 18.B, 19.C, 20.B, 21.B, 22.C, 23.B, 24.B, 25.B, 26.B, 27.C, 28.B, 29.B, 30.C

P1B Q1: (a) Substance A [1]. High melting point and conducts in liquid but not solid [1]. (b) Giant Covalent [1]; Diamond/Silicon [1].

P1B Q2: (a) BP increases with molar mass [1]; stronger London forces as electrons increase [1]. (b) H_2O has hydrogen bonding [1], which is much stronger than London forces in H_2S [1].

P1B Q3: (a) Solid: fixed lattice/no mobile ions [1], Solution: ions are mobile [1]. (b) Yes [1], ions become mobile [1].

P2 Q1: (a) BF_3 (Trigonal Planar, 6 valence electrons on B) [1], NH_3 (Trigonal Pyramidal, 1 LP on N) [1]. (b) BF_3: Trigonal planar [1]. NH_3: Tetrahedral EDG, Trigonal pyramidal MG [1]. (c) LP-BP repulsion is greater than BP-BP [1], pushing H atoms closer together [1].

P2 Q2: (a) Chlorine is more EN than Carbon; both are polar bonds [1]. (b) CH_3Cl is polar; CCl_4 is non-polar because symmetrical tetrahedral shape cancels dipoles [2].

P2 Q3: (a) Lattice of cations in sea of electrons [1]. Factors: charge (higher = stronger) [1] and radius (smaller = stronger) [1]. (b) Metal layers can slide [1]; Ionic layers repel if shifted (like charges align) [1].

P2 Q4: (a) Mg^{2+}: $1s^2\ 2s^2\ 2p^6$ [1]; O^{2-}: $1s^2\ 2s^2\ 2p^6$ [1]. (b) Larger charges (2+/2-) [1] result in much stronger electrostatic attraction than NaCl (1+/1-) [1], higher lattice energy [1].

P2 Q5: (a) Diamond: 3D network, sp^3, all covalent [2]. Graphite: Layers/sheets, sp^2, delocalized electrons between layers [2]. (b) Graphite [1], delocalized electrons are mobile [1].

P2 Q6: (a) N_2 is shorter and stronger [1]; triple bond vs single in hydrazine [1]. (b) More shared electrons (6 vs 2) increase nuclear-electron attraction [2].

P2 Q7: (a) London dispersion forces [1]. (b) He < Ne < Ar [1]; increasing molar mass increases number of electrons and strength of London forces [1].