MARKSCHEME - HL MATERIALS

P1A Answer Key:

1.B, 2.B, 3.B, 4.B, 5.A, 6.B, 7.B, 8.C, 9.B, 10.C, 11.B, 12.C, 13.B, 14.C, 15.C, 16.B, 17.C, 18.B, 19.C, 20.B, 21.B, 22.A, 23.B, 24.B, 25.B, 26.B, 27.B, 28.B, 29.B, 30.D, 31.C, 32.B, 33.A, 34.D, 35.C, 36.C, 37.B, 38.A, 39.D, 40.C

P1B Q1: (a) Polar covalent / network covalent [1]. High M.P., hard, brittle, non-conductive [2]. (b) Y has delocalized electrons in metallic lattice [1]. Z involves localized electrons in covalent bonds [1].

P1B Q2: (a) Proportion of reactant atoms that end up in the desired product [1]. In addition, all monomers become part of the polymer chain [1]. (b) Desired Product (PET Unit) = (62+90)-36 = 116 [1]. AE = (116 / 152) * 100 = 76.3% [2].

P1B Q3: (a) -CONH- linkage [1]. (b) Rigid benzene rings prevent chain rotation [1]. Amide groups allow for extensive inter-chain hydrogen bonding [1]. Alignment of chains into fibers [1].

P2 Q1: (a) Hexanedioic acid and Hexane-1,6-diamine [2]. Structures drawn [2]. (b) Nucleophilic attack of amine on carbonyl [1]; elimination of H_2O [1]. Bond formed: -CO-NH- [1].

P2 Q2: (a) n Ethane-1,2-diol + n $C_6H_4(COOH)_2$ → PET + 2n H_2O [3]. (b) Beverage bottles [1]. Recyclable, lightweight, chemically inert [1].

P2 Q3: (a) Substitutional: same sized atoms replace lattice (Brass) [2]. Interstitial: small atoms in gaps (Steel/Carbon) [2]. (b) Carbon atoms pin the planes of Iron ions [1], preventing sliding and reducing ductility [1].

P2 Q4: (a) Addition: C-C backbone is stable/unreactive [1]. Condensation: polar ester/amide links are suseptible to microbial enzymatic/acidic hydrolysis [2]. (b) Fragmentation of large plastics [1]. Accumulation of toxins/entering food chain [1]. Biological disruption to organisms [1].