MARKSCHEME - SL THERMODYNAMICS

P1A: 1.B, 2.C, 3.B (q=6.27kJ, DT=5, m=q/cDT=6270/(4.18*5)=300g), 4.C, 5.C, 6.C (-394 - -283 = -111), 7.D, 8.B, 9.D (Forward 70, DH -50, so reverse is 70+50=120), 10.C, 11.B, 12.B (q = 50 * 0.385 * -50 = -962.5), 13.B, 14.C, 15.D, 16.A (Broken: 2*436+498=1370; Formed: 4*463=1852; DH=-482), 17.C, 18.C, 19.C, 20.D

P1B Q1: (a) q = 100 * 4.18 * 6.5 = 2.717 kJ [2]. (b) n=0.05, DH = -2.717 / 0.05 = -54.3 kJ mol^{-}1 [2]. (c) i: DT doubles (twice the heat in same volume) [1], ii: No change (energy per mole remains same) [1].

P1B Q2: (a) Enthalpy change when 1 mol compound is formed from elements in standard states [2]. (b) Elements base, arrows pointing to products [2]. (c) DH = 2(-285.8) - 50.6 = -622.2 kJ mol^{-}1 [2].

P2 Q1: Endothermic [1]. Reactants are more stable as they have lower enthalpy [1].

P2 Q2: (a) Broken: 614 + 4(414) + 436 = 2706; Formed: 346 + 6(414) = 2830; DH = -124 kJ mol^{-}1 [4]. (b) Bond breaking is endothermic / requires energy [1].

P2 Q3: (a) q = 100 * 4.18 * 30 = 12.54 kJ. n(EtOH) = 1/46.07 = 0.0217 mol. DH = -12.54/0.0217 = -578 kJ mol^{-}1 [3]. (b) Incomplete combustion [1], heating the container (calorimeter) [1].

P2 Q4: H2(g) + 1/2 O2(g) → H2O(l) [2].

P2 Q5: (a) H+(aq) + OH-(aq) → H2O(l) [1]. (b) HF is a weak acid [1], energy required to fully dissociate HF bonds [1].