5. The simple decomposition of aluminium oxide powder requires the absorption of 1675.7 kJ of heat energy per mole of aluminium oxide. Assume standard conditions for the measurements of initial and final states.

a) Write a balanced chemical equation that includes the molar enthalpy of decomposition (as part of the equation) for aluminium oxide. [2]

$$Al_2O_{3(s)} + 1675.7\,kJ \longrightarrow 2Al_{(s)} + \frac{3}{2}O_{2(g)}$$

b) Determine the amount of heat energy needed to decompose 35.0 g of aluminium oxide. [2]

$m = 35.0\,g$

$M = Al \cdot 2 \cdot 26.989\,g/mol + O \cdot 3 \cdot 16.00\,g/mol$

$M = 101.96\,g/mol$

$n = ?$

$n = \frac{m}{M}$

$n = \frac{35.0\,g}{101.96\,g/mol}$

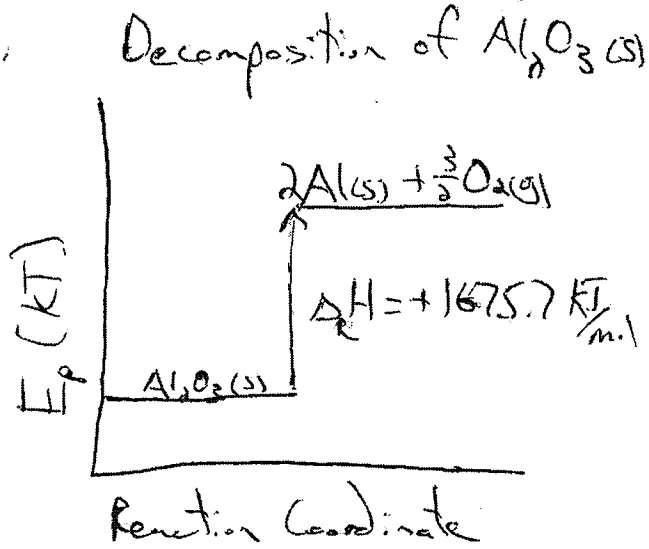
$n = 0.343\,mol$

$\Delta_R H = n \cdot \Delta_R H_m$

$\Delta_R H = +0.343\,mol \cdot 1675.7\,kJ/mol$

$\Delta_R H = +575\,kJ$

c) Sketch a *properly-labeled* potential energy diagram for this reaction. [3]



d) Would this reaction be classified as endothermic or exothermic? Explain your answer. [2]

- The reaction is endothermic.
- products reactants

$E_p > E_p$