

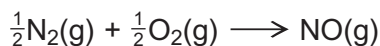
- 2** The balance between enthalpy change and entropy change determines the feasibility of a reaction. The table below contains enthalpy of formation and entropy data for some elements and compounds.

	N <sub>2</sub> (g)	O <sub>2</sub> (g)	NO(g)	C(graphite)	C(diamond)
$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	0	0	+90.4	0	+1.9
$S^\ominus / \text{J K}^{-1} \text{mol}^{-1}$	192.2	205.3	211.1	5.7	2.4

- 2 (a)** Explain why the entropy value for the element nitrogen is much greater than the entropy value for the element carbon (graphite).  
 .....  
 .....  
 .....  
 (2 marks)
- 2 (b)** Suggest the condition under which the element carbon (diamond) would have an entropy value of zero.  
 .....  
 (1 mark)
- 2 (c)** Write the equation that shows the relationship between  $\Delta G$ ,  $\Delta H$  and  $\Delta S$  for a reaction.  
 .....  
 (1 mark)
- 2 (d)** State the requirement for a reaction to be feasible.  
 .....  
 (1 mark)



- 2 (e)** Consider the following reaction that can lead to the release of the pollutant NO into the atmosphere.



Use data from the table on page 4 to calculate the minimum temperature above which this reaction is feasible.

.....

.....

.....

.....

.....

.....

.....

(5 marks)

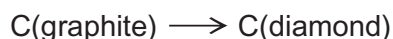
- 2 (f)** At temperatures below the value calculated in part **2 (e)**, decomposition of NO into its elements should be spontaneous. However, in car exhausts this decomposition reaction does **not** take place in the absence of a catalyst. Suggest why this spontaneous decomposition does **not** take place.

.....

.....

(1 mark)

- 2 (g)** A student had an idea to earn money by carrying out the following reaction.



Use data from the table on page 4 to calculate values for  $\Delta H^\ominus$  and  $\Delta S^\ominus$  for this reaction. Use these values to explain why this reaction is **not** feasible under standard pressure at any temperature.

$\Delta H^\ominus$  .....

$\Delta S^\ominus$  .....

Explanation .....

.....

(3 marks)

