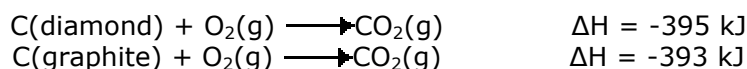


Exercise 4.32 – Energy cycles

Q432-01 Draw an enthalpy level diagram for the neutralisation reaction between dilute hydrochloric acid and aqueous sodium hydroxide. Indicate on your diagram the enthalpy change of the reaction, and hence compare the relative stabilities of the reactants and products.

Q432-02 Given the following information:



Construct an enthalpy cycle and use it to calculate the transformation of diamond into graphite.

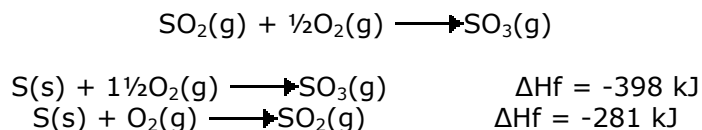
Q432-03 The standard enthalpy change for the combustion of phenol, $\text{C}_6\text{H}_5\text{OH}(\text{s})$, is $-3050 \text{ kJ mol}^{-1}$ at 298K.

a) Write an equation for the complete combustion of phenol, $\text{C}_6\text{H}_5\text{OH}(\text{s})$.

The standard enthalpy changes of formation of carbon dioxide, $\text{CO}_2(\text{g})$ and of water, $\text{H}_2\text{O}(\text{l})$ are -394 kJ mol^{-1} and -286 kJ mol^{-1} respectively.

b) Draw a Hess's law enthalpy cycle linking these processes and use it to calculate the standard enthalpy change of formation of phenol, $\text{C}_6\text{H}_5\text{OH}(\text{s})$.

Q432-04 Using the following equations construct an enthalpy cycle and use it to find the enthalpy change for the conversion of sulphur(IV) oxide into sulphur(VI) oxide:



Q432-05 Construct a simple enthalpy cycle and calculate the value of ΔH_f^\ominus ($\text{C}_2\text{H}_5\text{OH}(\text{l})$) given the following data:

Compound	$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	$\Delta H_c^\ominus / \text{kJ mol}^{-1}$
$\text{H}_2\text{O}(\text{l})$	-286	
$\text{CO}_2(\text{g})$	-394	
$\text{C}_2\text{H}_5\text{OH}(\text{l})$		-1371