Q1 What enthalpy change is a Born-Haber cycle usually used to calculate? Give the definition of this enthalpy change
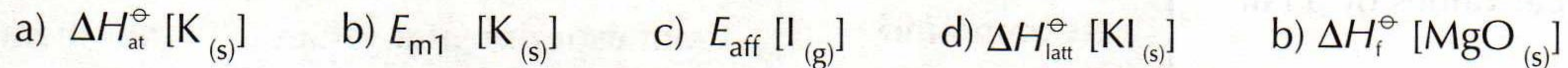
Q2 Give chemical equations for the following, including the state symbols of all the species present:

   a) $\Delta H^{\ominus}_{at}$ [K $_{(s)}$]   b) E_{m1} [K $_{(s)}$]   c) E_{aff} [I $_{(g)}$]   d) $\Delta H^{\ominus}_{latt}$ [KI $_{(s)}$]   b) $\Delta H^{\ominus}_{f}$ [MgO $_{(s)}$]

Exam Questions

Q1 The enthalpy changes involved in the formation of calcium oxide are shown below.

   Enthalpy of atomisation of calcium = +177 kJ mol^{-1} First ionisation energy of calcium = +590 kJ mol^{-1}

   Second ionisation energy of calcium = +1100 kJ mol^{-1} Enthalpy of atomisation of oxygen = +249 kJ mol^{-1}

   Electron affinity of an oxygen atom = −141 kJ mol^{-1} Electron affinity of O^{-} = +790 kJ mol^{-1}

   Lattice energy of calcium oxide = −3401 kJ mol^{-1}

   a) Calculate the enthalpy of formation for calcium oxide using the information given above.   **[3 marks]**

   b) The electron affinity of the O^{-} ion is +790 kJ mol^{-1}. Explain why the electron affinity of O^{-} is positive.   **[2 marks]**

Q2 Use the data below to calculate the lattice energy of magnesium chloride, $MgCl_2$.

   Enthalpy of atomisation of magnesium = +148 kJ mol^{-1} First ionisation energy of magnesium = +738 kJ mol^{-1}

   Second ionisation energy of magnesium = +1451 kJ mol^{-1} Enthalpy of atomisation of chlorine = +122 kJ mol^{-1}

   Electron affinity of a chlorine atom = −349 kJ mol^{-1} Enthalpy of formation of $MgCl_2(s)$ = −641 kJ mol^{-1}

          [4 marks]