5.1 EXERCISE 2 - BORN-HABER CYCLES

1. Use the data below to calculate the electron affinity of chlorine:

Process	Enthalpy change/kJmol^{-1}
Standard enthalpy of atomisation of potassium	+90
First ionisation enthalpy of potassium	+420
Bond dissociation enthalpy of chlorine	+244
Lattice enthalpy of potassium chloride	-706
Standard enthalpy of formation of potassium chloride	-436

2. Calculate the lattice enthalpy of sodium chloride from the following data:

Process	Enthalpy change/kJmol^{-1}
$Na(s) \rightarrow Na(g)$	+109
$Na(g) \rightarrow Na^+(g) + e$	+494
$Cl_2(g) \rightarrow 2Cl(g)$	+242
$Cl(g) + e \rightarrow Cl^-(g)$	-360
$Na(s) + 1/2Cl_2(g) \rightarrow NaCl(s)$	-411

3.a) Calculate the electron affinity of chlorine from the following data:

Process	Enthalpy change/kJmol^{-1}
$Ca(s) \rightarrow Ca(g)$	+190
$Ca(g) \rightarrow Ca^{2+}(g) + 2e$	+1730
$1/2Cl_2(g) \rightarrow Cl(g)$	+121
$Ca^{2+}(g) + 2Cl^-(g) \rightarrow CaCl_2(s)$	-2184
$Ca(s) + Cl_2(g) \rightarrow CaCl_2(s)$	-795

b) Use the reactions

$Ca(g) \rightarrow Ca^+(g) + e$	+590
$Ca^+(g) + Cl^-(g) \rightarrow CaCl(s)$	-760

To calculate the standard enthalpy of formation of CaCl(s) and hence explain why $CaCl_2$ is formed in preference to CaCl.