

HL Questions on Energy cycles

1. In Section 19 of the data booklet the enthalpy of aqueous solution of potassium chloride is given as $+17.22 \text{ kJ mol}^{-1}$. **(a)** Draw an energy cycle showing how the enthalpy of solution is related to the lattice enthalpy and the relevant hydration enthalpies for potassium chloride. **(b)** Use the values given in Sections 18 and 20 to calculate the enthalpy of solution and compare the value you obtain with the value given in Section 19.

2. **(a)** Draw a Born-Haber cycle for the formation of rubidium chloride from its elements in their standard states.

(b) Use the information given to calculate a value for the lattice enthalpy of rubidium chloride.

Enthalpy of formation of rubidium chloride	$= -431 \text{ kJ mol}^{-1}$
Enthalpy of atomization of rubidium	$= +85.8 \text{ kJ mol}^{-1}$
Enthalpy of atomization of chlorine	$= +121 \text{ kJ mol}^{-1}$
First ionization energy of rubidium	$= +403 \text{ kJ mol}^{-1}$
Electron affinity of chlorine	$= -349 \text{ kJ mol}^{-1}$

(c) Compare your value with the theoretical value of -680 kJ mol^{-1} .

What can be inferred from this comparison about the bonding in rubidium chloride?

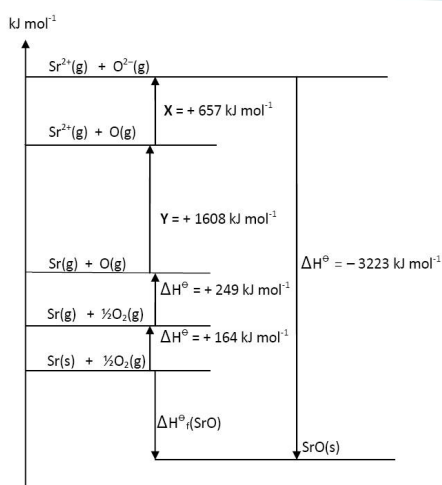
3. Explain the following:

(a) The lattice enthalpy of magnesium oxide is larger than the lattice enthalpy of calcium oxide.

(b) The lattice enthalpy of magnesium chloride is larger than the lattice enthalpy of sodium chloride.

(c) The lattice enthalpy of sodium fluoride is larger than the lattice enthalpy of sodium chloride.

4. The following shows an enthalpy level diagram for the formation of strontium oxide.



(a) Draw the Born-Haber cycle for the formation of strontium oxide.

(b) Identify the correct names for X and Y.

(c) Calculate the value for the enthalpy of formation of strontium oxide.