5.1 ANSWERS TO EXERCISES

5.1 Exercise 1

1. i) -818 $kJmol^{-1}$ ii) -1436 $kJmol^{-1}$ iii) -113 $kJmol^{-1}$
   iv) -101 $kJmol^{-1}$ v) -94 $kJmol^{-1}$
2. +56 $kJmol^{-1}$

5.1 Exercise 2

1. -362 $kJmol^{-1}$
2. -775 $kJmol^{-1}$
3. a) -386.5 $kJmol^{-1}$
   b) lattice energy of CaCl is -245.5 $kJmol^{-1}$
   this is less exothermic than the lattice energy of $CaCl_2$
   the reaction: $2CaCl(s) \rightarrow Ca(s) + CaCl_2(s)$ is exothermic
   and so should be spontaneous

5.1 Exercise 3

1. +11 $kJmol^{-1}$
2. $Ba(OH)_2$: -45 $kJmol^{-1}$, $Ca(OH)_2$: +80 $kJmol^{-1}$, $Mg(OH)_2$: +155 $kJmol^{-1}$
   the more exothermic a reaction, the more likely it is to be spontaneous
   so $Ba(OH)_2$ is the most soluble, followed by $Ca(OH)_2$ and then $Mg(OH)_2$
3. +77 $kJmol^{-1}$
   this is more endothermic than the enthalpy of solution of NaCl
   so dissolving AgCl is less spontaneous than dissolving NaCl

5.1 Exercise 4

1. ΔH = +135 $kJmol^{-1}$
   ΔS = +334 $JK^{-1}mol^{-1}$
   Reaction feasible above 404 K (131 ^oC)
2. ΔS = -99.4 $JK^{-1}mol^{-1}$
   Reaction feasible below 462 K (189 ^oC); the lower the temperature, the higher the yield
3. ΔS = +305.3 $JK^{-1}mol^{-1}$
   Reaction feasible above 102 K
   so feasible at all temperatures for which water is liquid