Worksheet 18.4

The solubility and thermal stability of some Group II compounds

1 The Group II sulfates decrease in solubility down the group. This is due to differences in the values of their lattice energies and their enthalpy changes of hydration.

a How does the value of the enthalpy change of hydration of the cation change down Group II from magnesium to barium? Explain your answer. [4]

b How does the value of the lattice energy of the Group II sulfates change down the group from magnesium to barium? Explain your answer. [3]

c As you go down the Group II sulfates, why is the change in the value of the lattice energy relatively small compared with the change in the value of the enthalpy change of hydration? [3]

d What is the relationship between lattice energy, enthalpy change of hydration and enthalpy change of solution? [1]

e The change in the value of the lattice energy down the group from $MgSO_4$ to $BaSO_4$ is less marked than the change in the value of the enthalpy change of hydration.
Use this idea and your answer to part **d** to suggest why the Group II sulfates decrease in solubility down the group. [3]

2 Group II carbonates and nitrates undergo thermal decomposition.

a Write an equation for the thermal decomposition of strontium carbonate. Include state symbols. [2]

b Name a Group II carbonate which decomposes at a lower temperature than strontium carbonate. [1]

c Write a balanced equation for the thermal decomposition of barium nitrate. Include state symbols. [3]

d Would you expect calcium nitrate to decompose at a lower temperature than barium nitrate? Explain your answer. [4]