4 The table below gives some values of standard enthalpy changes. Use these values to answer the questions.

Name of enthalpy change	$\Delta H^{\ominus}$/kJ mol^{-1}
Enthalpy of atomisation of chlorine	+121
Electron affinity of chlorine	–364
Enthalpy of atomisation of silver	+289
First ionisation enthalpy of silver	+732
Enthalpy of formation of silver chloride	–127

4 (a) Calculate the bond enthalpy of a Cl−Cl bond.

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(1 mark)

4 (b) Explain why the bond enthalpy of a Cl−Cl bond is greater than that of a Br−Br bond.

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(2 marks)

4 (c) Suggest why the electron affinity of chlorine is an exothermic change.

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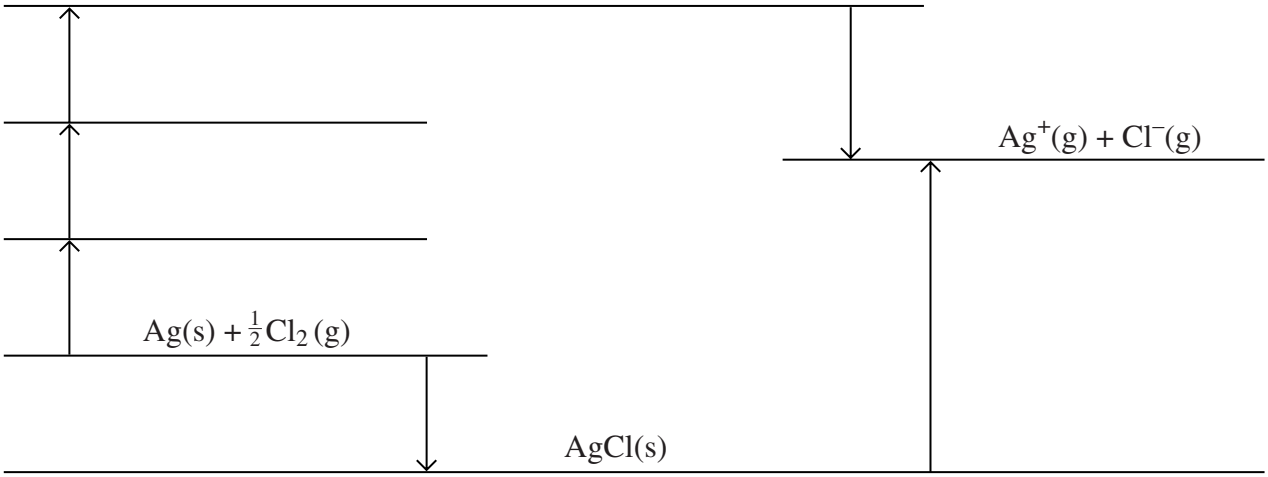
(1 mark)

4 (d) The diagram below is an incomplete Born–Haber cycle for the formation of silver chloride. The diagram is not to scale.



4 (d) (i) Complete the diagram by writing the appropriate chemical symbols, with state symbols, on each of the three blank lines. *(3 marks)*

4 (d) (ii) Calculate a value for the enthalpy of lattice dissociation for silver chloride.

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(2 marks)

Question 4 continues on the next page

4 (e) The enthalpy of lattice dissociation for silver chloride can also be calculated theoretically assuming a perfect ionic model.

4 (e) (i) Explain the meaning of the term *perfect ionic model*.

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(1 mark)

4 (e) (ii) State whether you would expect the value of the theoretical enthalpy of lattice dissociation for silver chloride to be greater than, equal to or less than that for silver bromide. Explain your answer.

Theoretical lattice enthalpy for silver chloride .....

Explanation .....

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(3 marks)

(Extra space) .....

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4 (e) (iii) Suggest why your answer to part (d) (ii) is greater than the theoretical value for the enthalpy of lattice dissociation for silver chloride.

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(2 marks)

15