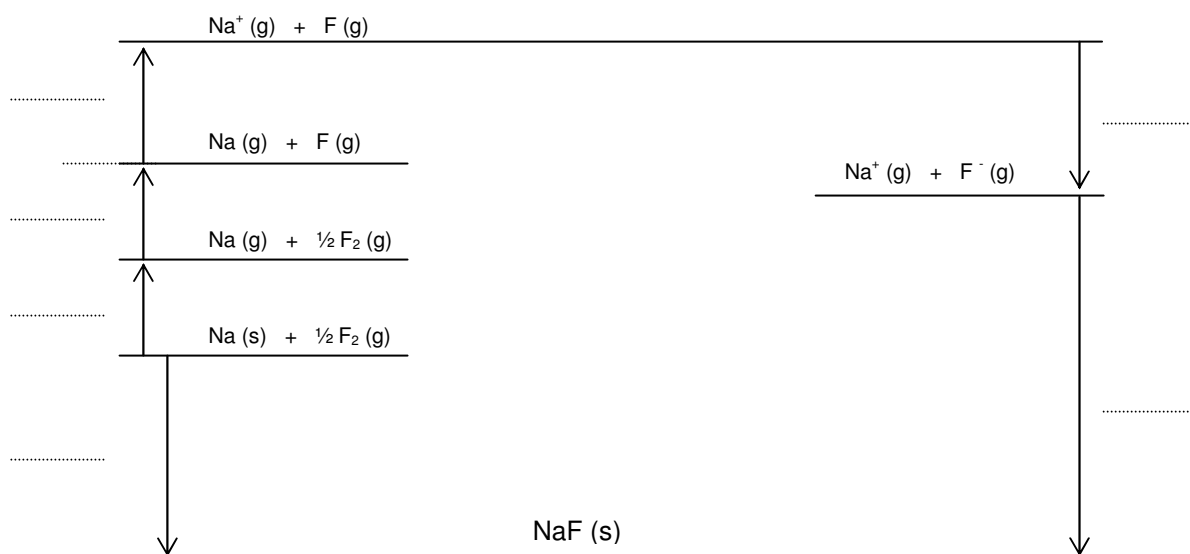


## BORN-HABER CYCLES

The outline of a Born-Haber cycle for the formation of sodium fluoride from its elements is shown below. The enthalpy changes involved are not drawn to scale.



a) Define the term *lattice enthalpy of formation*.

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b) The data relating to formation of sodium fluoride are shown in the table below. Each enthalpy change has a letter to be marked on the cycle in the appropriate position.

	Description of enthalpy change	Enthalpy change/kJ mol <sup>-1</sup>
A	Lattice enthalpy of formation of NaF	-903
B	Enthalpy of atomisation of sodium	109
C	Enthalpy of atomisation of fluorine	79
D	First ionisation enthalpy of sodium	-
E	First electron affinity of fluorine	-348
F	Enthalpy of formation of NaF	-569

c) Use the data to calculate the value of the first ionisation enthalpy of sodium.

\_\_\_\_\_ kJ mol<sup>-1</sup>