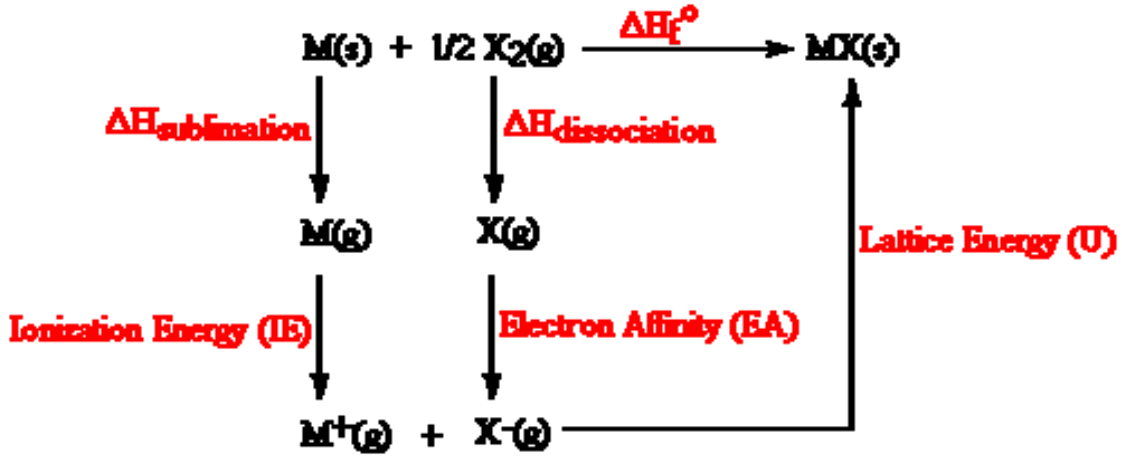
Born-Haber cycle

Born-Haber cycles are used primarily for the calculation of lattice enthalpies, which cannot be measured directly.



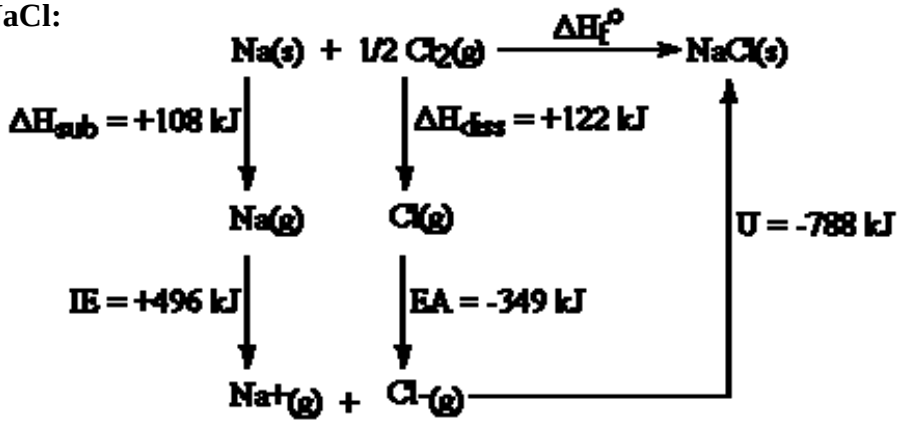
$$\Delta H_f^\circ = \Delta H_{sub} + IE + \Delta H_{diss} + EA + U$$

The lattice enthalpy: is the formation of the ionic compound from gaseous ions. The lattice enthalpy is always exothermic

Enthalpy of formation: is the energy change when 1 mol of substance is formed from the constituent elements at standard conditions.

A Born-Haber cycle calculates the lattice enthalpy by comparing the standard enthalpy change of formation of the ionic compound (from the elements) to the enthalpy required to make gaseous ions from the elements. This is an application of Hess's Law.

Born haber cycle for NaCl:



$$\Delta H_f^\circ = \Delta H_{sub} + IE + \Delta H_{diss} + EA + U$$

$$\Delta H_f^\circ = 108 + 496 + 122 - 349 - 788 = -411 \text{ kJ/mole}$$