How to draw Born–Haber cycles

Born–Haber cycles are named after two German scientists, Max Born and Fritz Haber. They were developed to calculate the lattice enthalpy of an ionic compound using Hess’s law. For this you need to know the standard enthalpy change of formation as well as various enthalpy changes needed to make the gaseous ions from the elements in their standard states.

You can also use these cycles to compare which processes contribute most to the overall stability of the ionic compound.

How to draw a Born–Haber cycle for sodium chloride

It’s helpful to draw the cycle as an enthalpy level diagram so you can easily distinguish the endothermic and exothermic processes.

**Step 1**
Break the existing metallic and covalent bonding in the elements to form gaseous atoms of the metal and non-metal.

**Step 2**
Remove the outer electron from the gaseous metal atoms. This is endothermic as you have to work against the attraction of the nucleus to remove an electron.

**Step 3**
Transfer the electron removed from the metal to the gaseous non-metal atoms. This is exothermic as the attraction of the nucleus pulls the additional electron towards the atom.

**Step 4**
Bring the gaseous ions together to form the solid ionic lattice. This is highly exothermic due to the strong attraction between the ions throughout the crystal.

**Step 5**
Complete the cycle by directly connecting the starting elements to the solid ionic compound.