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

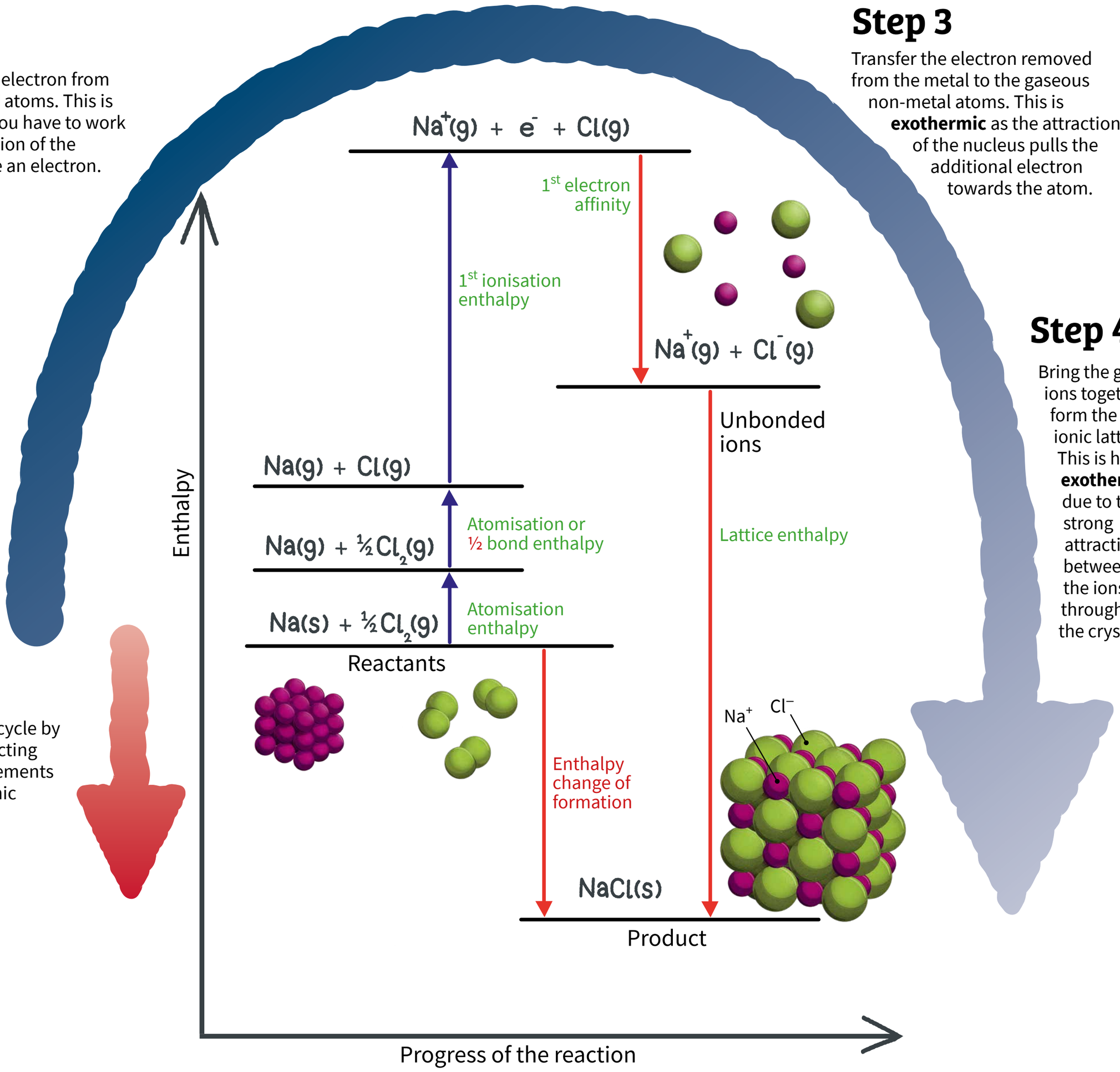
Transfer the electron removed from the metal to the gaseous non-metal atoms. This is **exothermic** as the attraction of the nucleus pulls the additional electron towards the atom.

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.



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