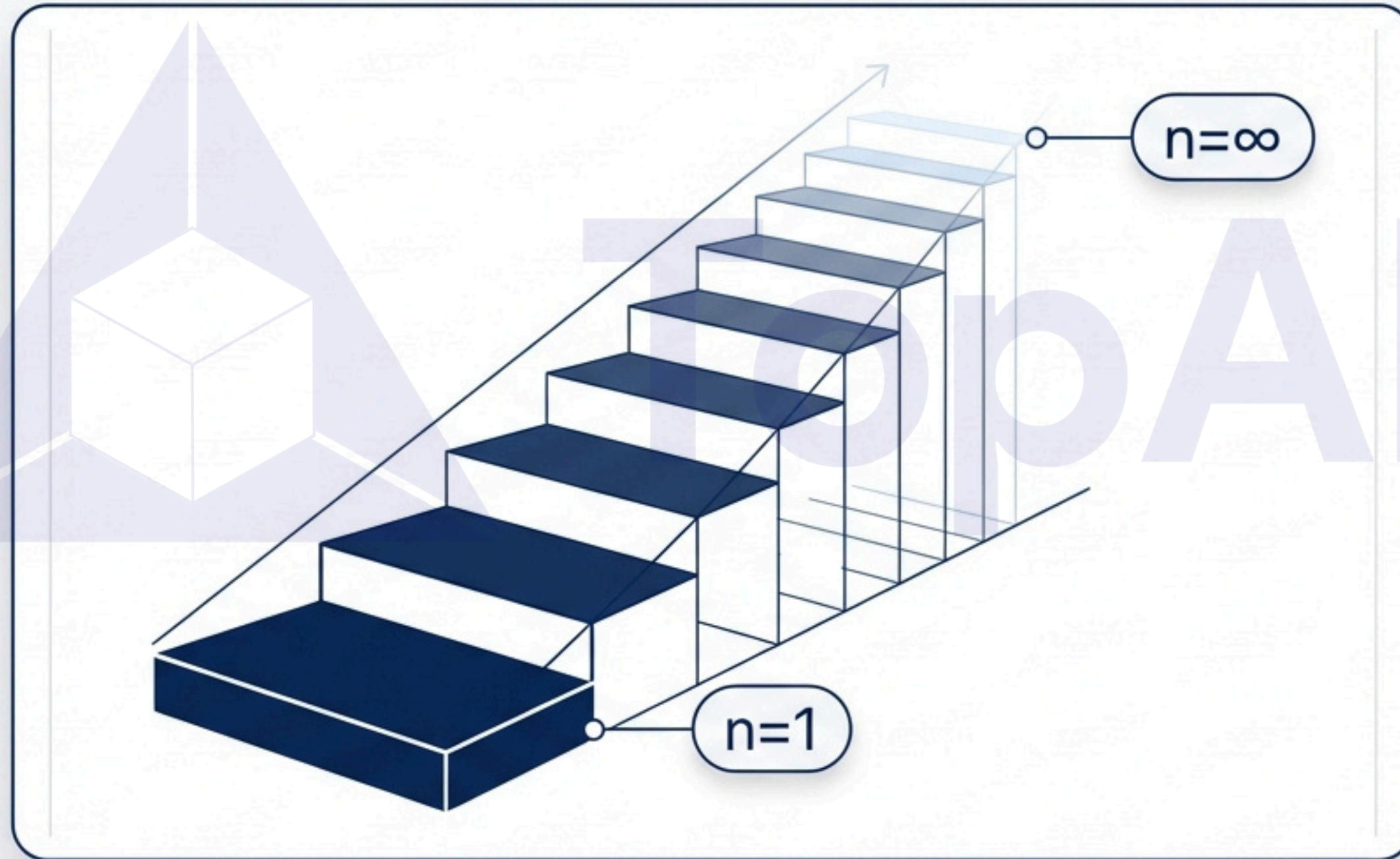


Energy Levels in Hydrogen Atom

Why atomic energy comes in fixed steps



The Ground State: The Deep Well

Ground State ($n = 1$)

-13.6 eV

- The lowest possible energy state.
- Electron revolves in the smallest radius (Bohr radius, a_0).

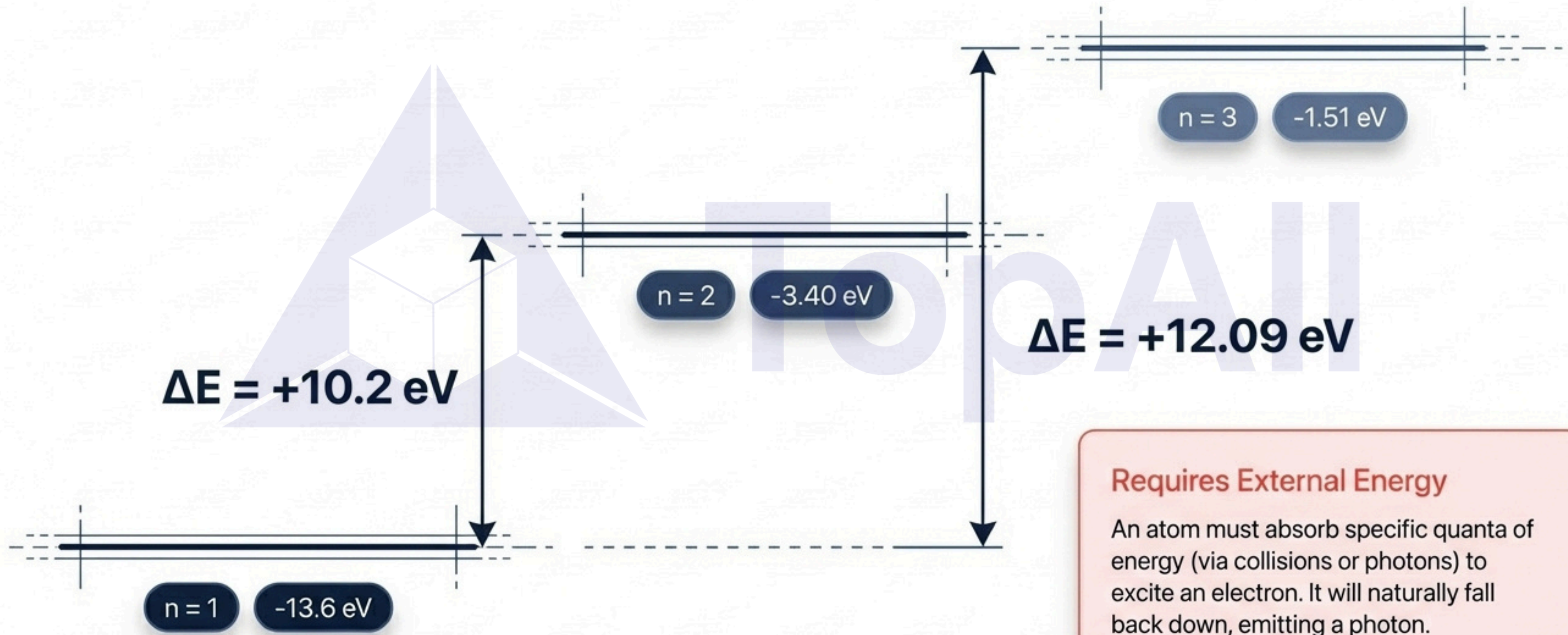
Context: At room temperature, most hydrogen atoms sit entirely in this state.

Negative value = Bound to the nucleus

Maximum Stability



Excited States: Climbing the Ladder





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$$E=mc^2$$



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Key Highlights

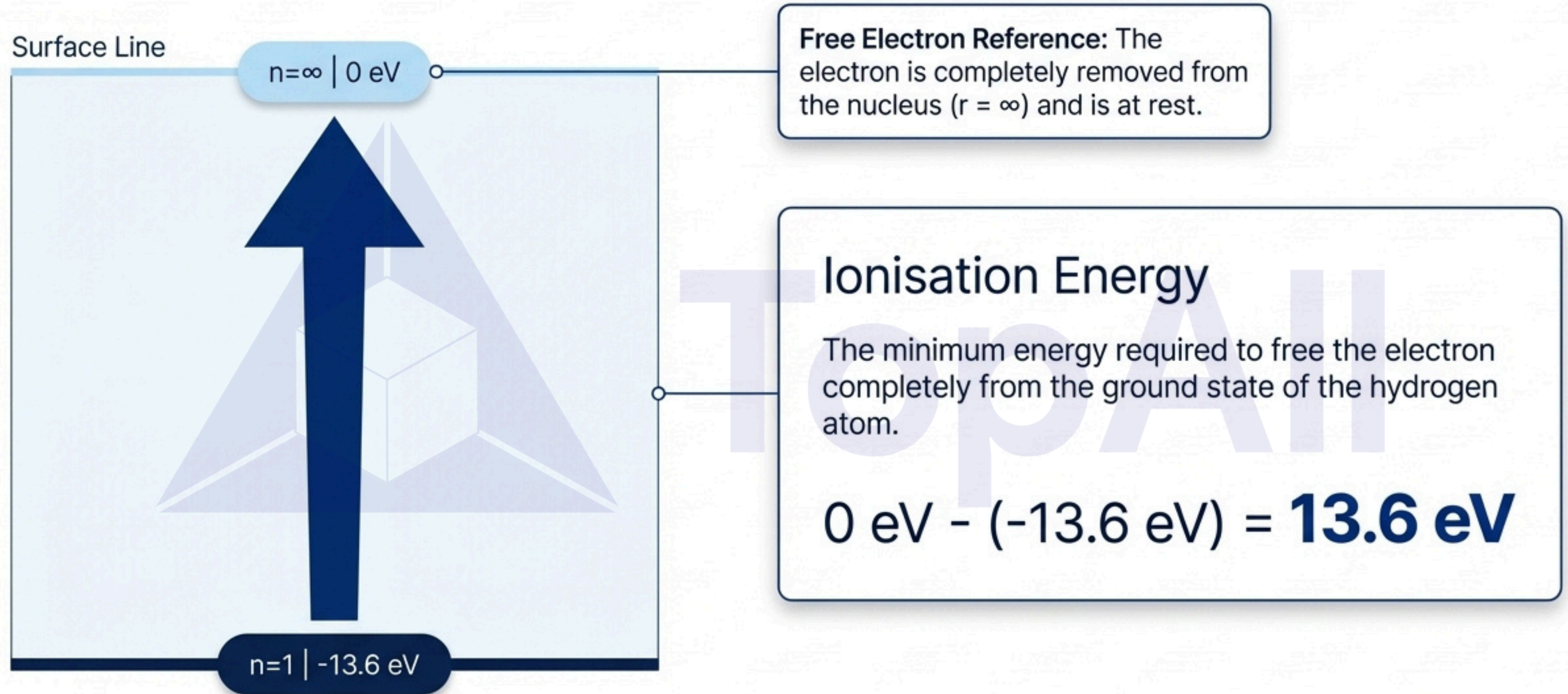
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The Master Energy Level Diagram



Ionisation: Escaping the Nucleus

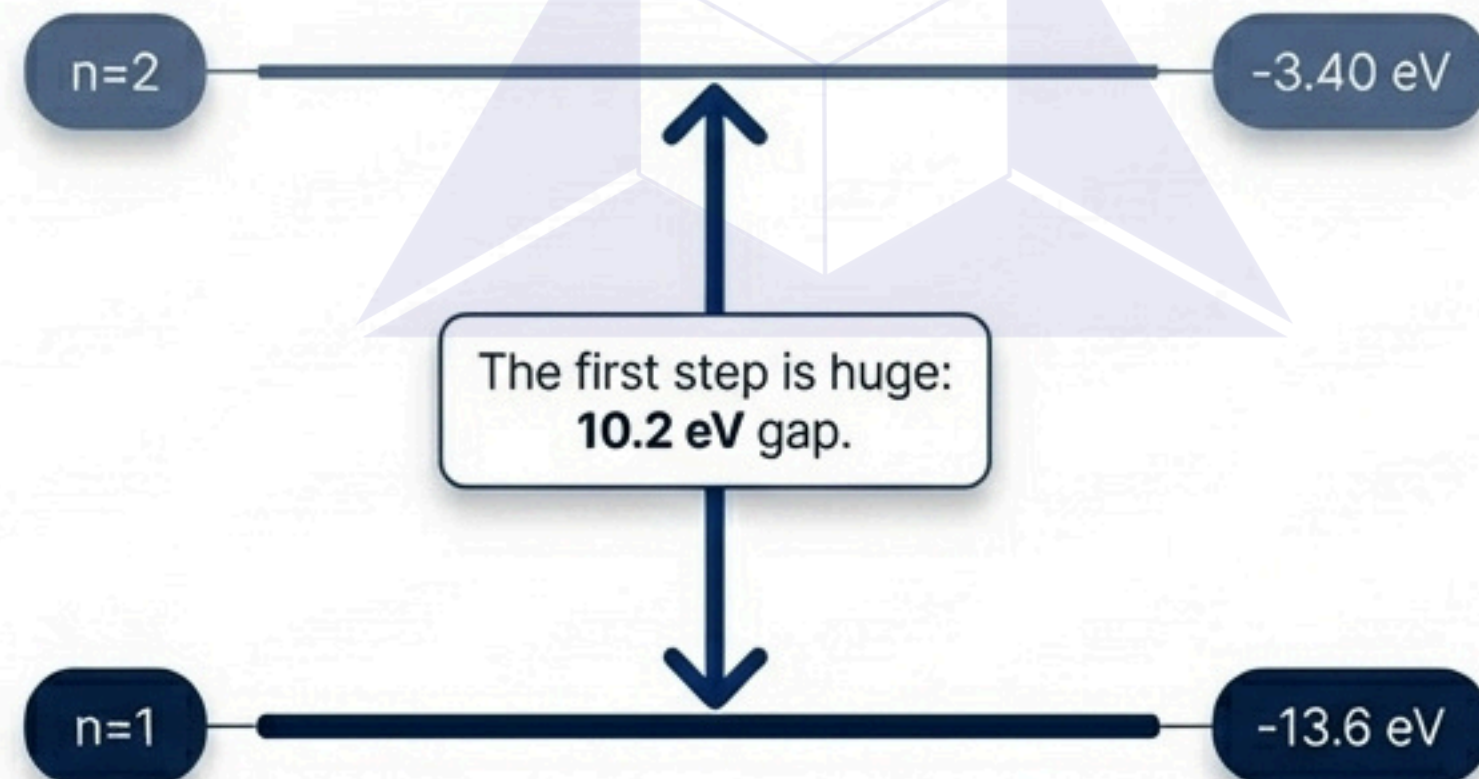


Why do the levels get closer together?

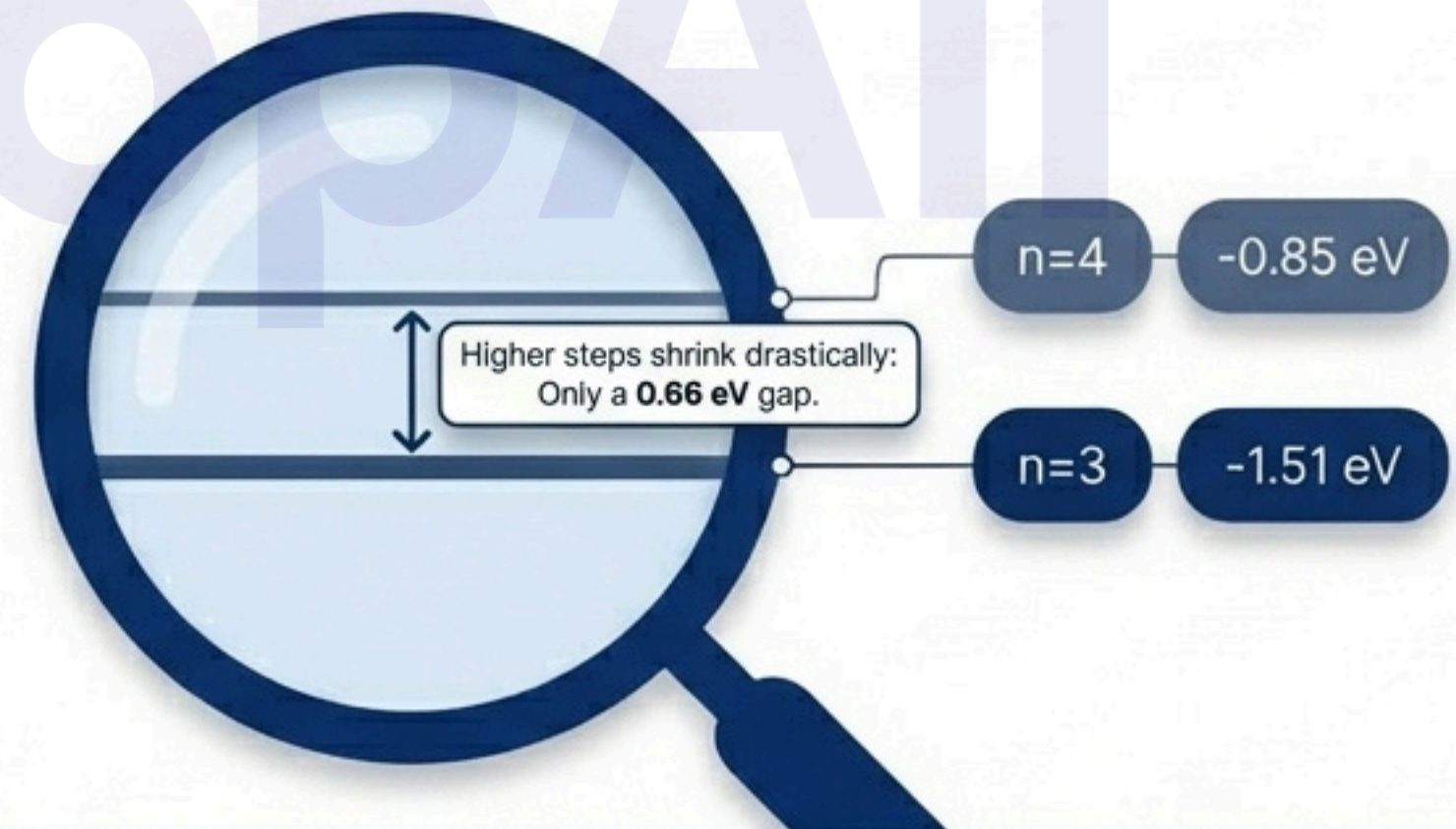
$$E_n = \frac{-13.6}{n^2} \text{ eV}$$

Energy scales inversely with the square of the principal quantum number. Higher n means exponentially smaller jumps.

The Massive Gap



The Magnifying Glass



Mastery Check

Key Takeaways

- Ground state ($n=1$) is the most stable, lowest energy level (-13.6 eV).
- 0 eV means the electron is completely free and at rest ($n=\infty$).
- Energy levels are fixed and crowd closer together at higher states due to the $1/n^2$ rule.

What is the energy required to excite a hydrogen atom from its ground state to its first excited state?

10.2 eV ($E_2 - E_1$)

Why is the total energy of an electron in an orbit negative?

It indicates the electron is bound to the nucleus by attractive electrostatic forces.

→ Next: Line Spectra of Hydrogen



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