

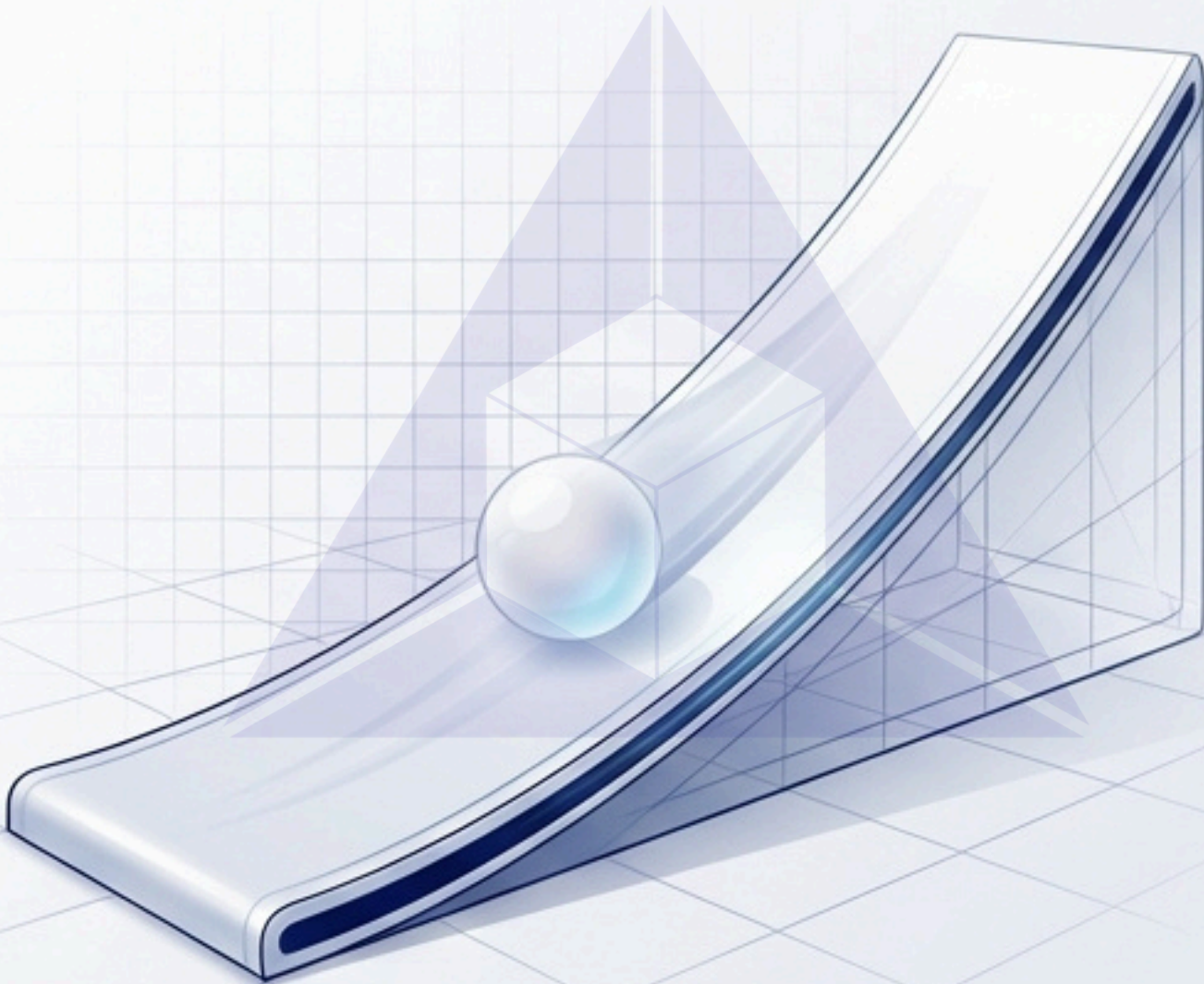
The Line Spectra of the Hydrogen Atom

How electron jumps
create visible spectral lines



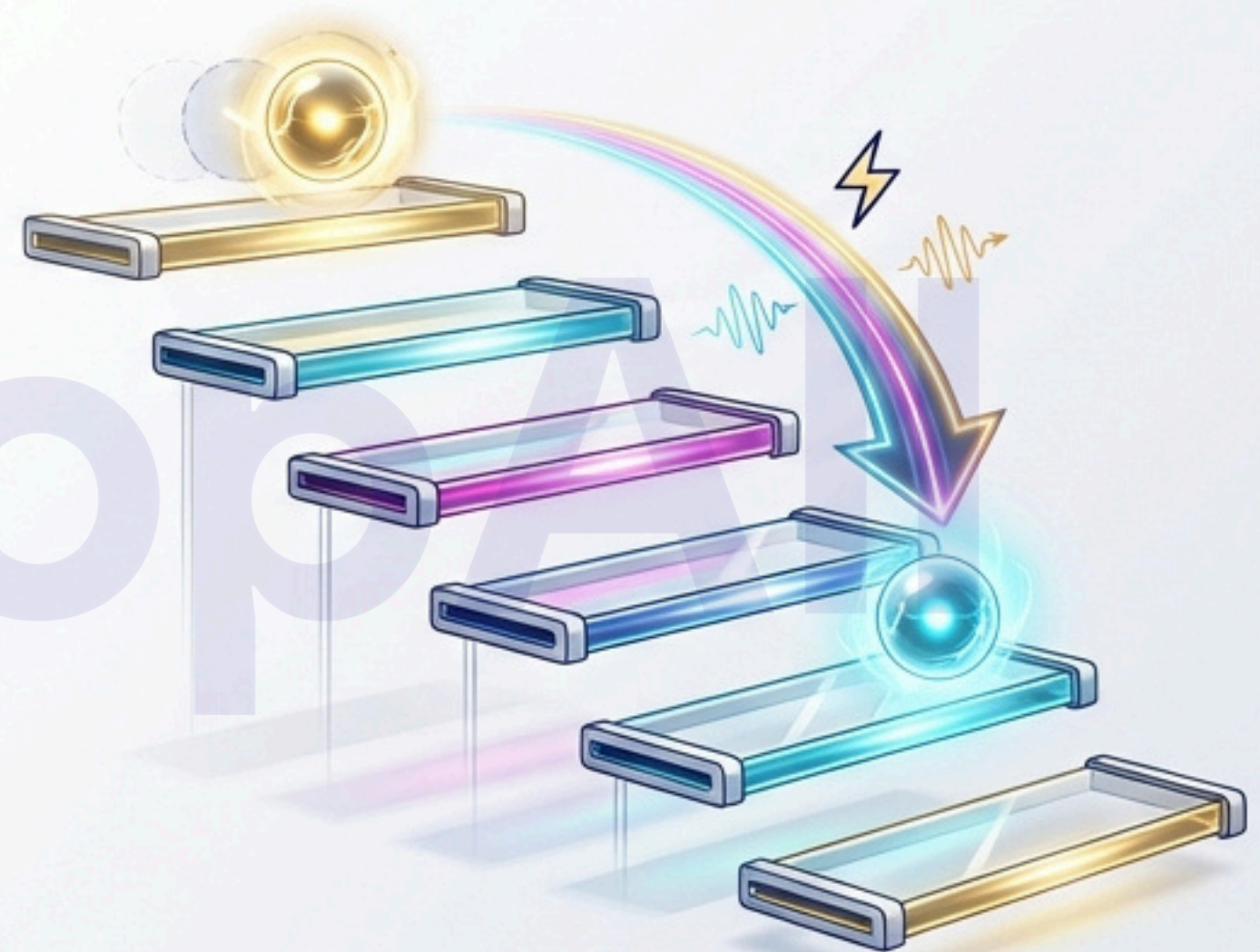
The Quantum Staircase Rule

Classical Physics: Continuous



Electrons can exist at any energy level.

Quantum Physics: Discrete



Electrons must vanish from one step and appear on another. They cannot exist in the space between.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

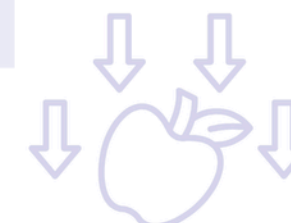
Practice Now



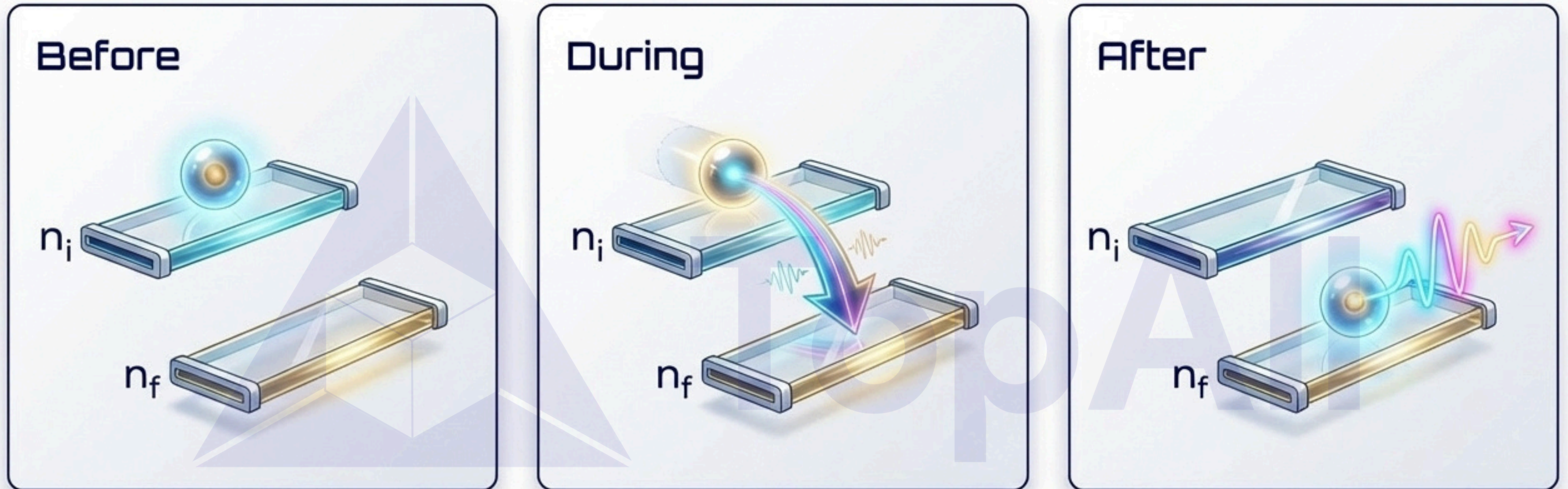
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Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Emission: Creating a Spectral Line

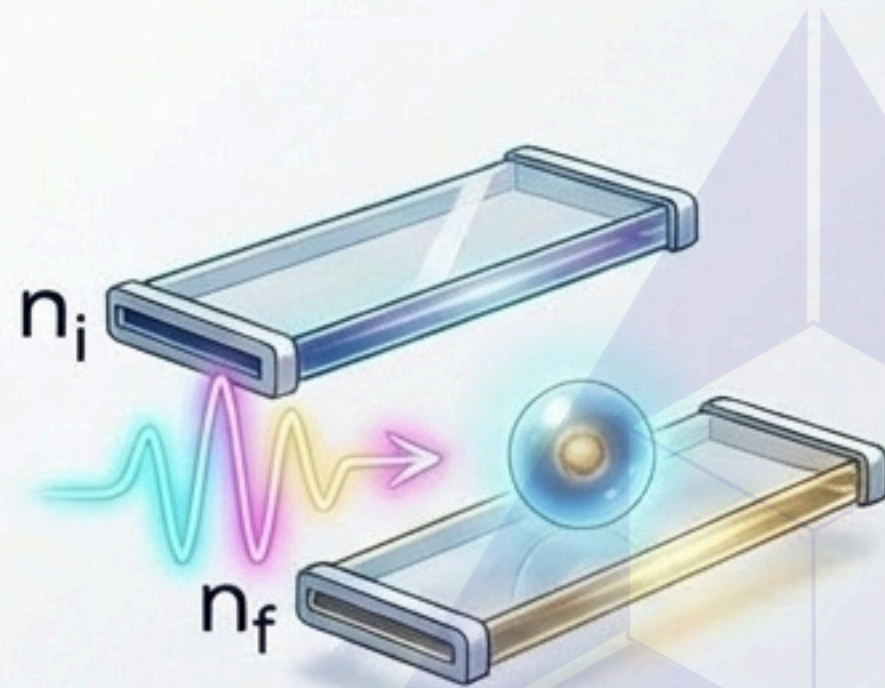


$$h\nu = E_i - E_f$$

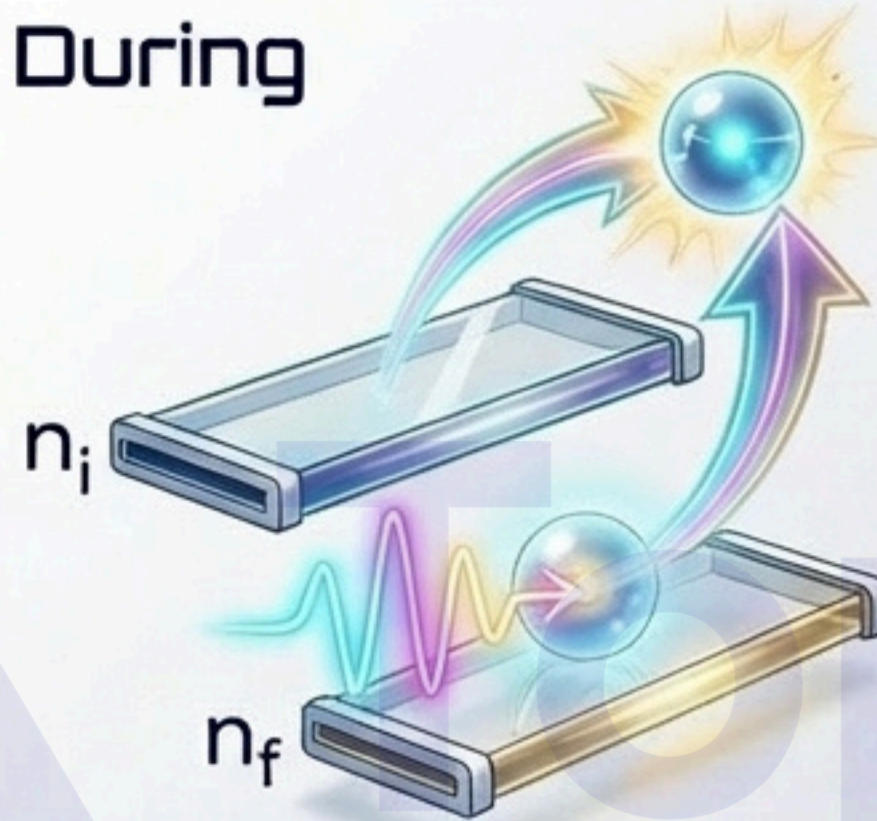
Energy of the escaping photon

Absorption: The Upward Jump

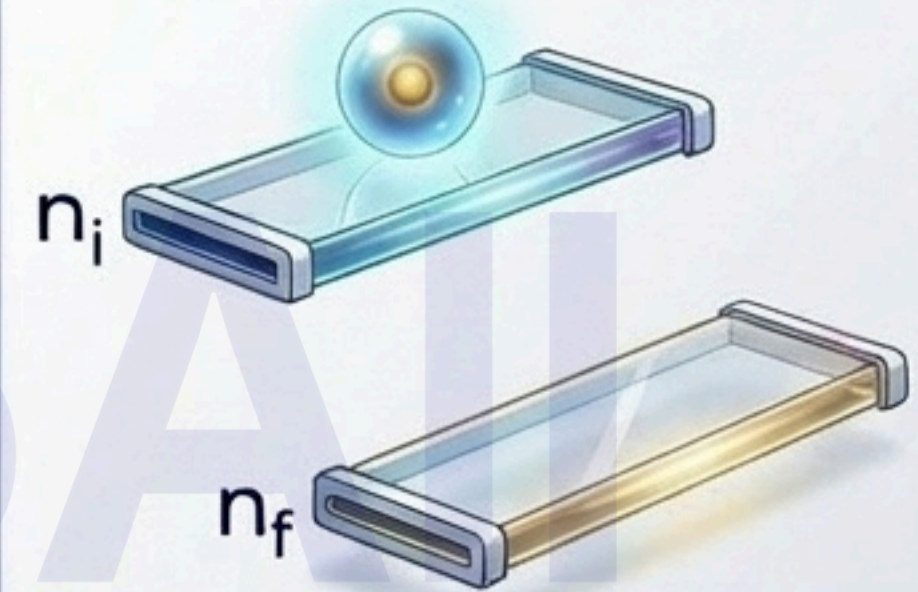
Before



During



After

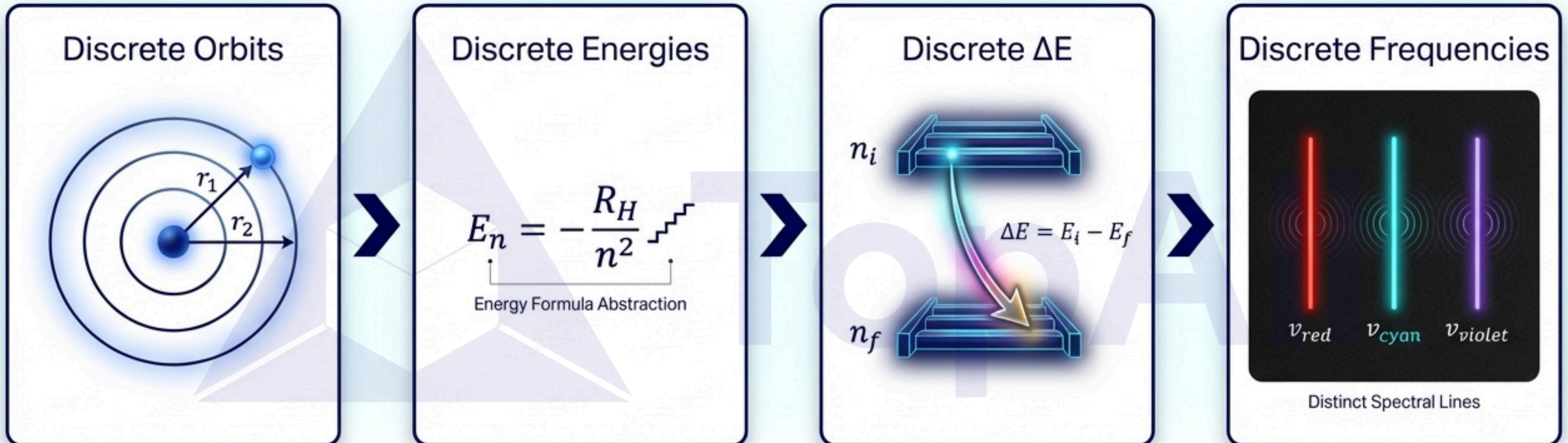


$$E_i = E_f + h\nu$$

Energy of the absorbed photon

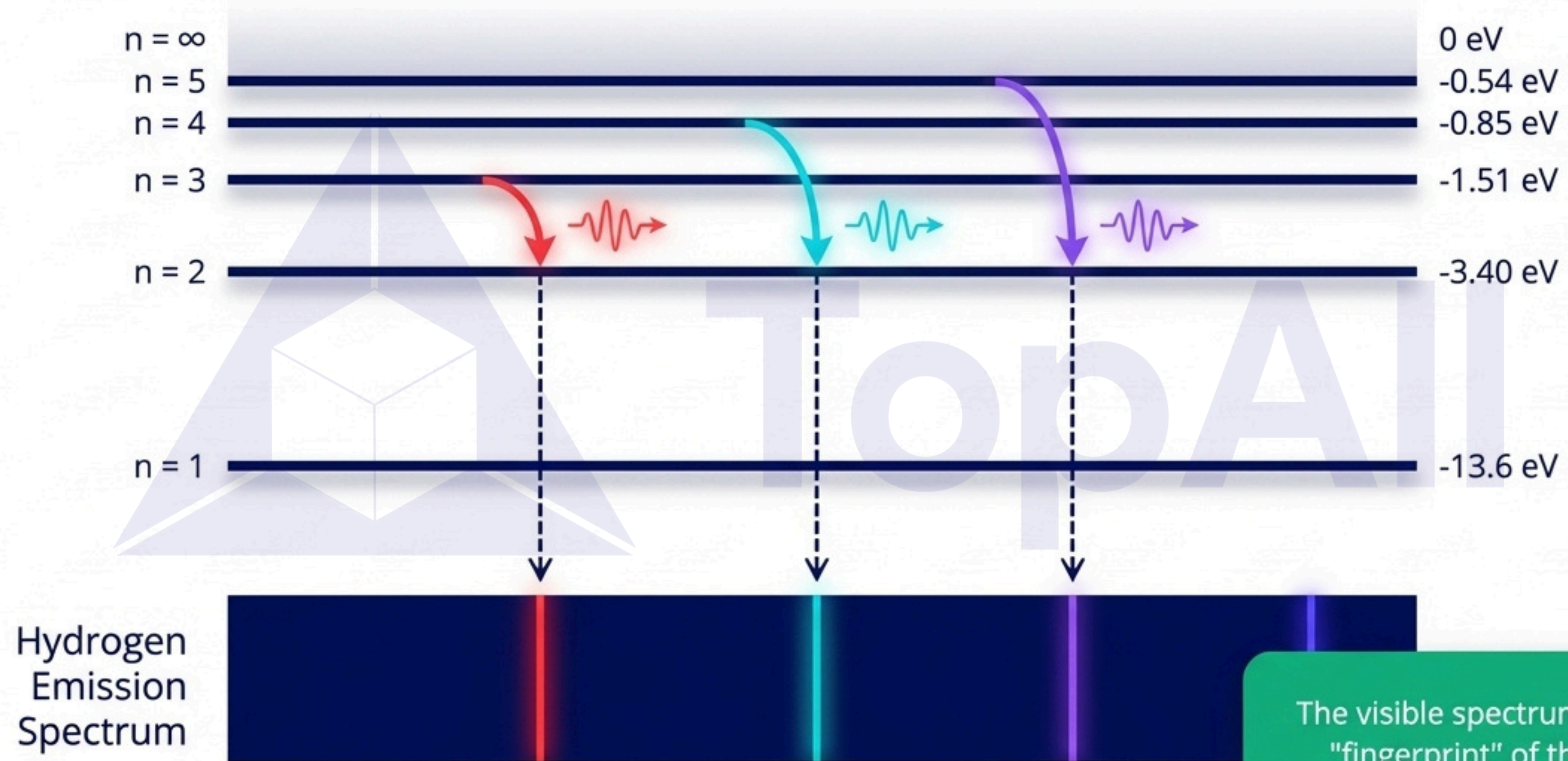
Unlike emission, absorption requires a photon with the exact energy gap value. "Close enough" energy will not be absorbed.

Why Only Certain Lines Appear



Because electrons can only make specific jumps, they can only release photons of specific frequencies. These distinct frequencies become the line spectrum.

The Spectrum as a Map of Jumps



The visible spectrum is a literal "fingerprint" of the atom's internal orbit structure.

Recap & Check Your Understanding



Downward Jump =
Photon Emission



Upward Jump = **Exact**
Photon Absorption



Energy Gap (ΔE) dictates the
light frequency

Q: An electron drops from $n=3$ to $n=1$. Does it emit or absorb light?

Emit.

Q: A hydrogen electron needs 10.2 eV to jump from $n=1$ to $n=2$. If a 10.5 eV photon hits it, will it jump?

No. The energy must match the gap exactly.

Next: de Broglie's Explanation →



You've Learned the Theory.

Now Let's Test It.

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Practicing MCQs gets you marks.

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Practice the moment you finish studying
Jump in while the concept is still fresh in your head

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