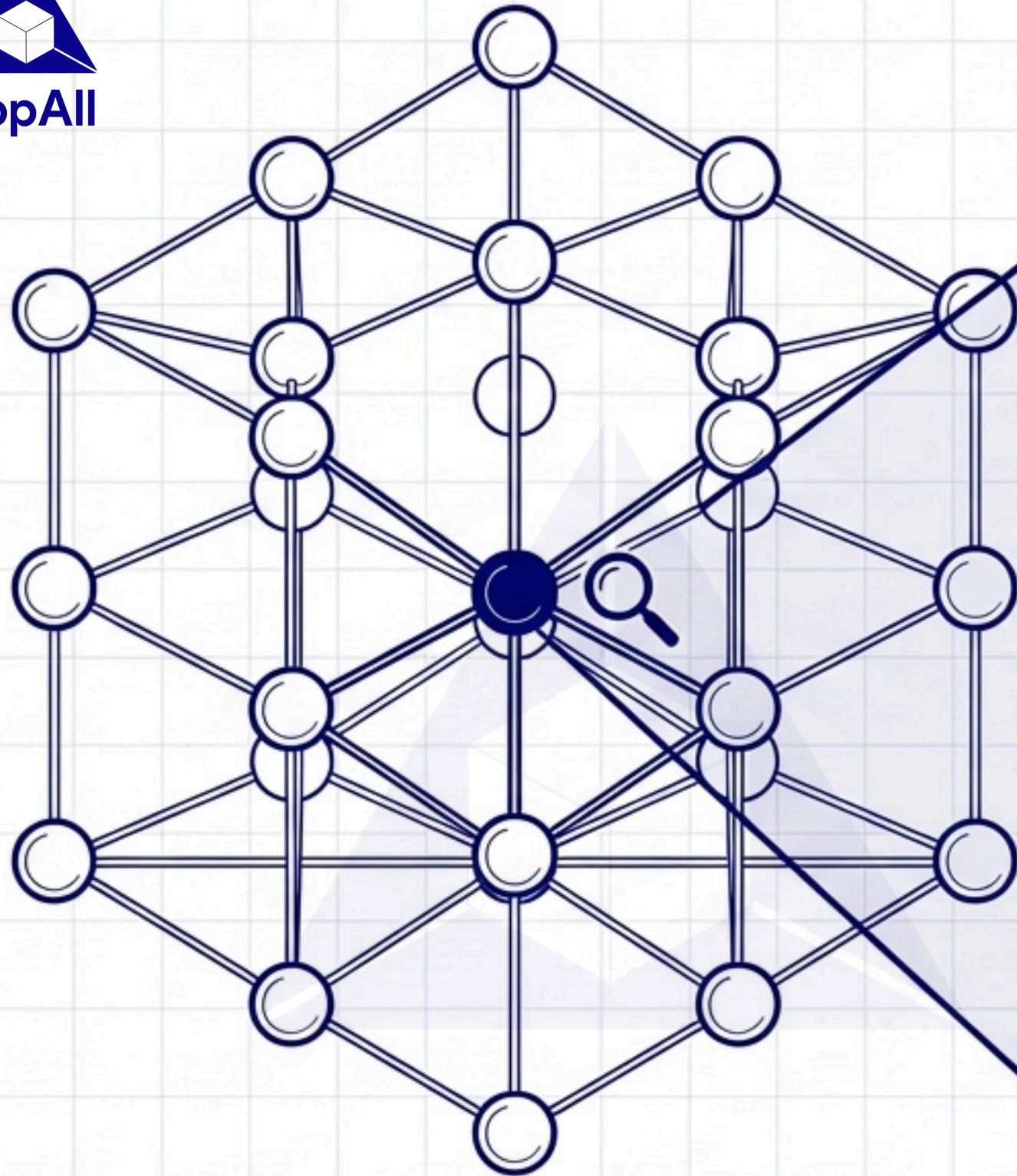


Intrinsic Semiconductor

Pure crystal structures, thermal excitation,
and the generation of charge carriers.

Master the baseline state of elemental semiconductors before diving into doping.



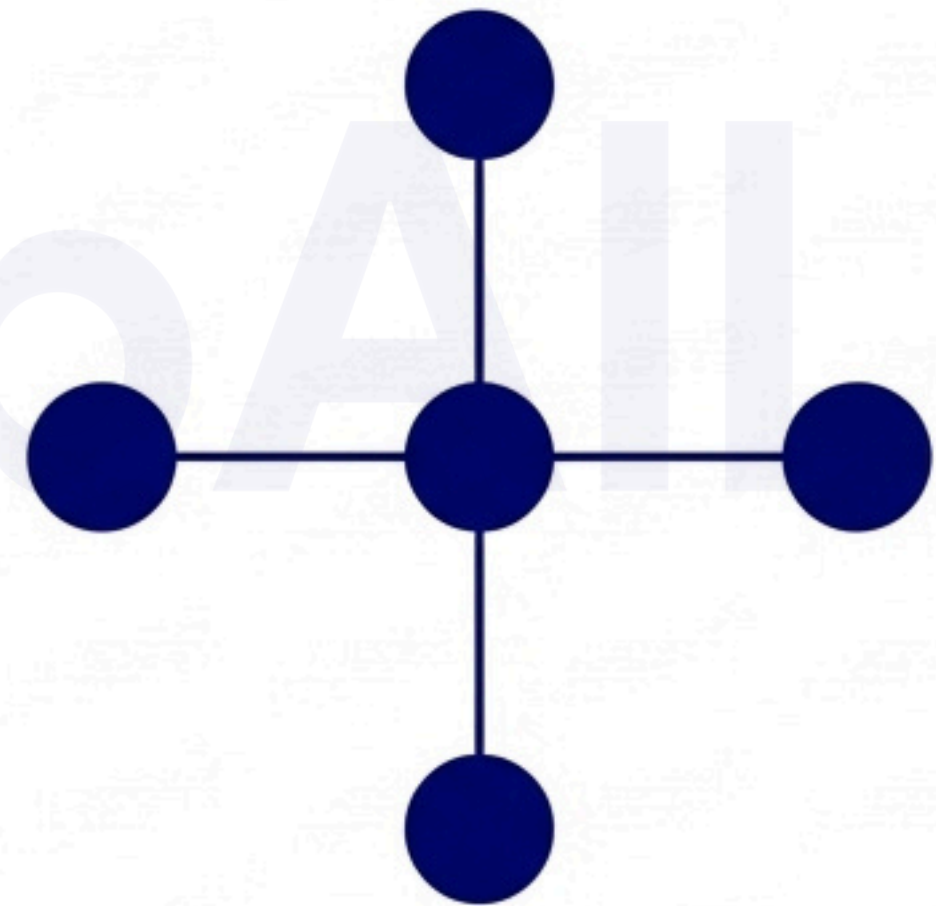
3D Diamond-Like Lattice

ELEMENTAL SEMICONDUCTORS

The Pure Crystal Lattice

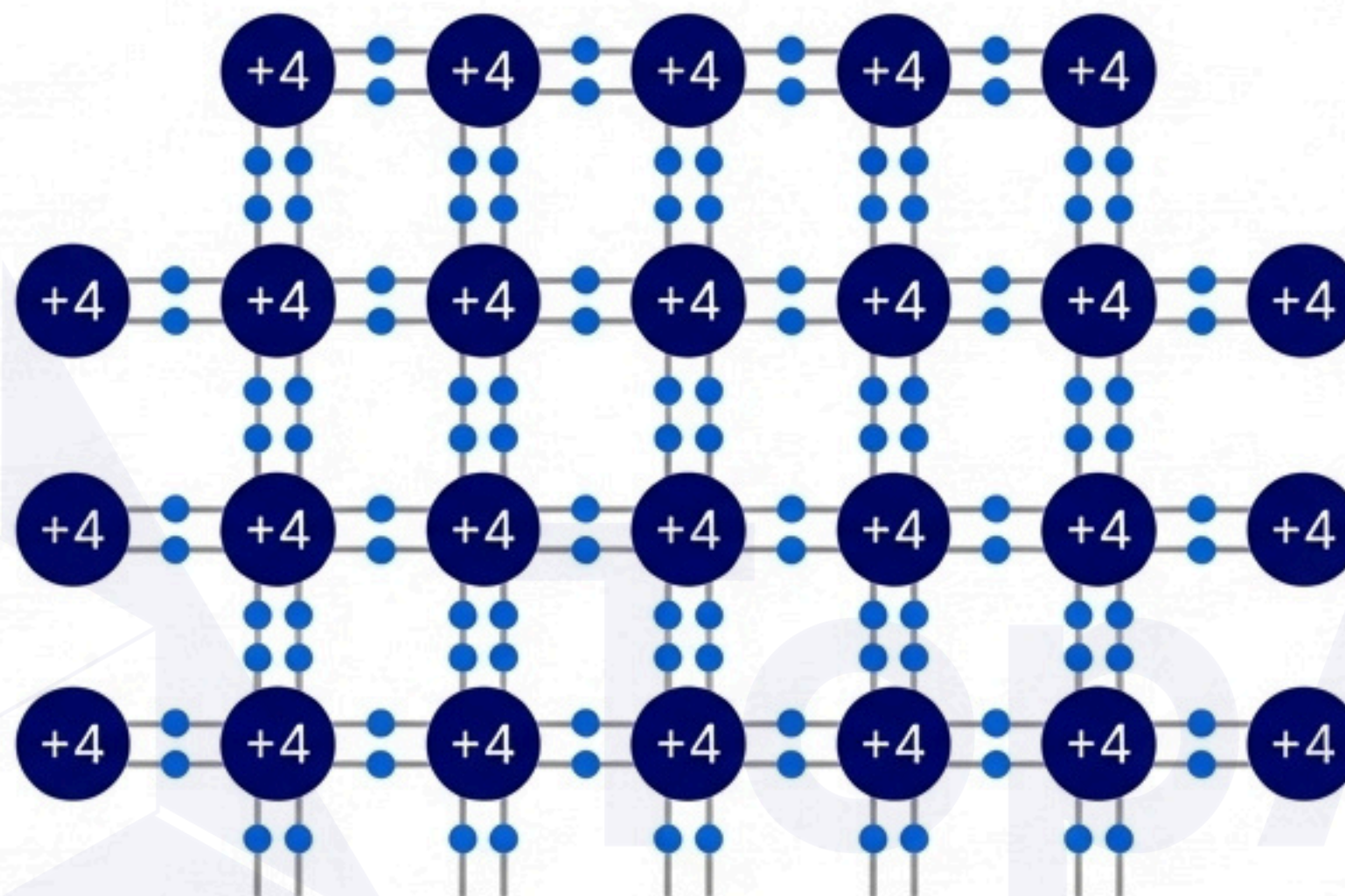
Pure Silicon (Si) and Germanium (Ge) form diamond-like 3D crystal structures. Every atom has exactly 4 valence electrons.

Tetravalent
Element



Covalent Bonding at Absolute Zero

STATE: $T = 0\text{ K}$



The Idealized State

At low temperatures, all bonds are perfectly intact. The two shared electrons shuttle back-and-forth holding atoms together strongly. Because no free electrons exist, the intrinsic semiconductor behaves as a perfect insulator.



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

$$E=mc^2$$



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Practice Now



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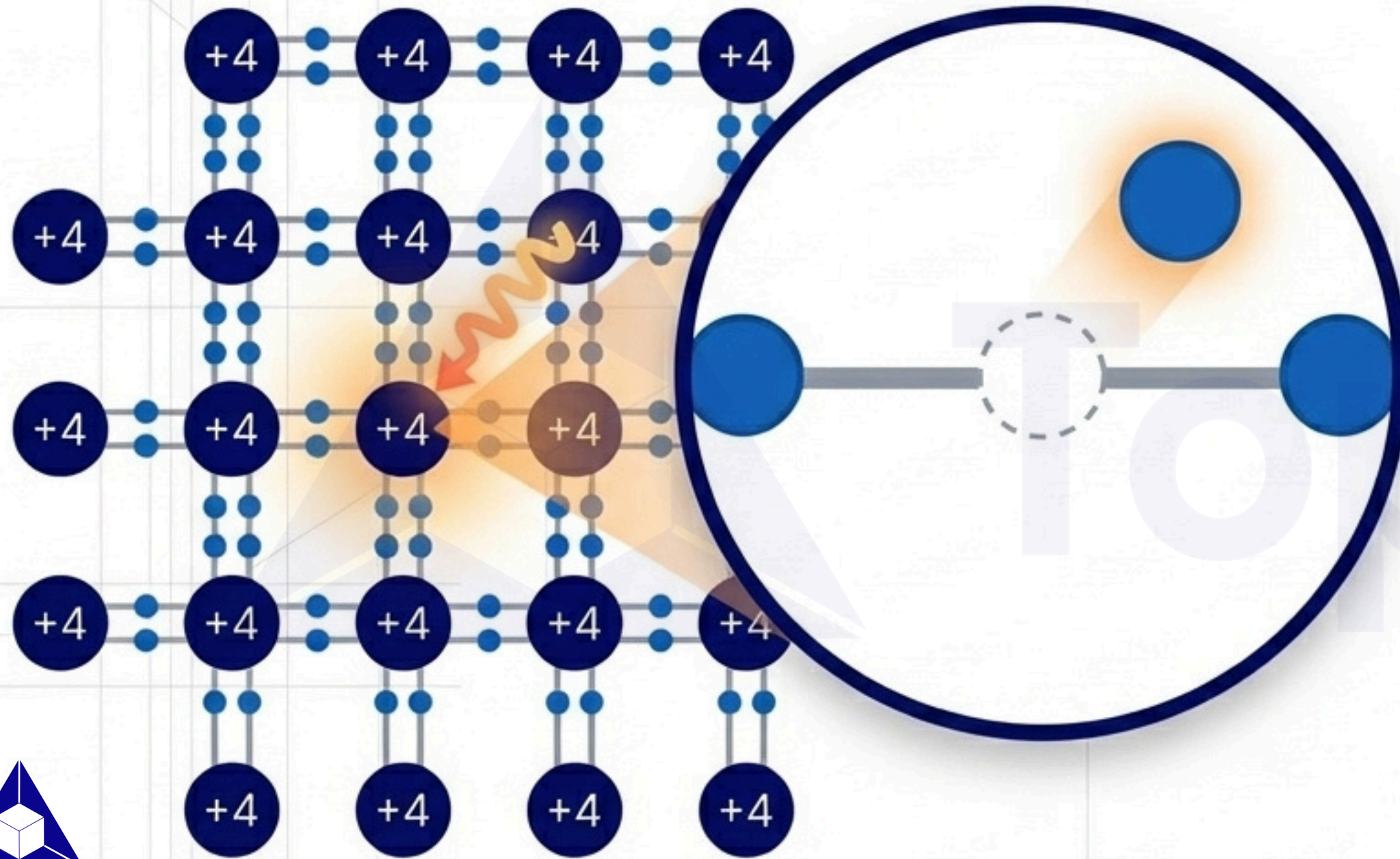
Key Highlights

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- » 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



Thermal Excitation

STATE: $T > 0\text{ K}$ (ROOM TEMPERATURE)



1. Heat Applies Energy

Thermal energy ionizes a few atoms in the crystalline lattice.

2. Bonds Break

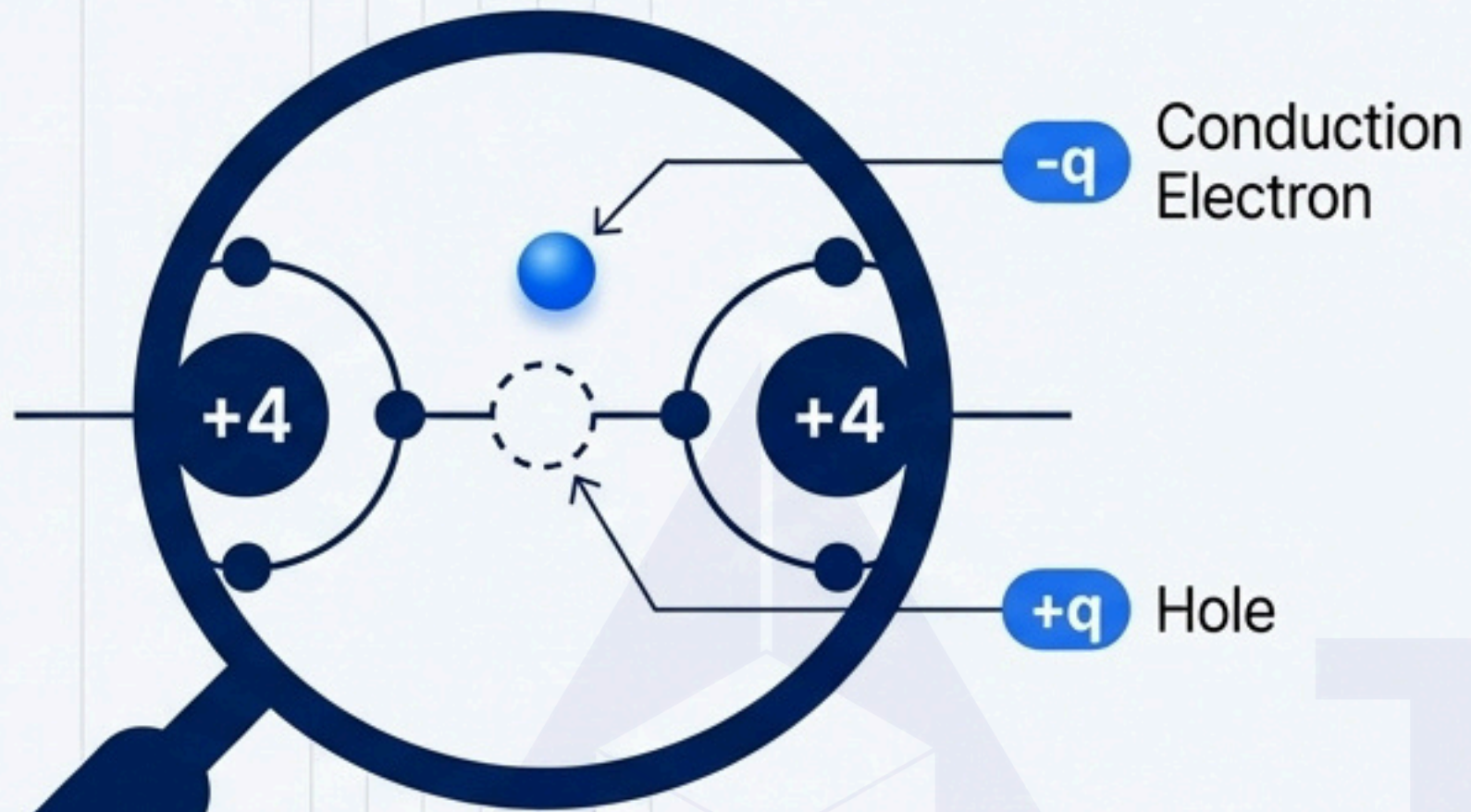
An electron gains enough energy to break away from its covalent bond.

3. Vacancy Created

The escaped electron leaves behind an empty space in the bond.

Creation of Electron-Hole Pairs

Primary Brand Navy Plus Jakarta Sans



The freed electron becomes a **conduction electron**. The missing electron leaves behind a **vacancy** called a **hole**—an apparent free particle with an effective positive charge.

Generation & Recombination occur simultaneously.

$$n_e = n_h = n_i$$

n_e (Free Electrons) = n_h (Holes) = n_i (Intrinsic Carrier Concentration)

$$\text{Total Current } I = I_e + I_h$$

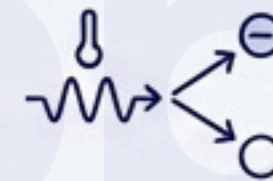
Summary & Exam Takeaways

	Absolute Zero (0 K)	Room Temp (T > 0 K)
Bonds	All intact	Some broken by thermal energy
Carriers	None available	Electron-hole pairs exist
Behavior	Perfect Insulator	Conducts electricity

High-Yield Revision



Intrinsic = Pure semiconductor (Si, Ge) with no doping.



Charge carriers are strictly generated by thermal energy.

$$n_e = n_h$$

The number of electrons always equals the number of holes ($n_e = n_h$).



You've Learned the Theory.

Now Let's Test It.

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