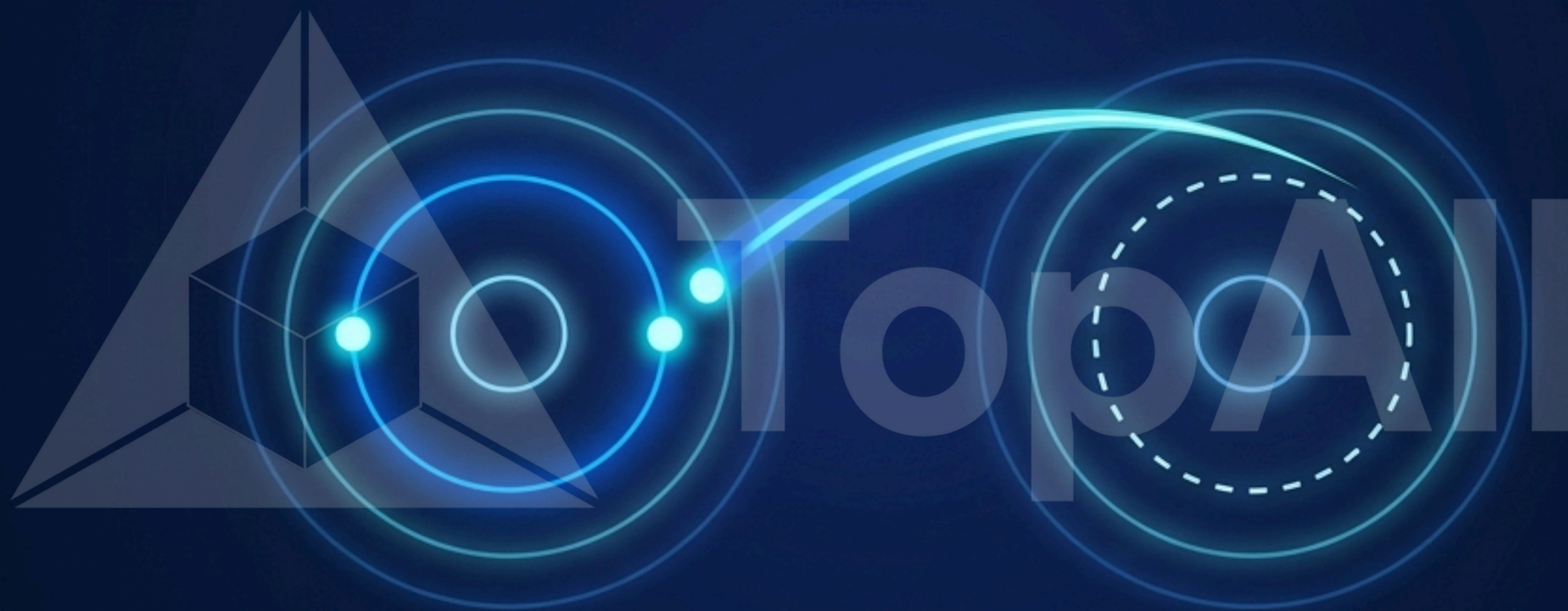


Acids Without Hydrogen?

Decoding the Lewis Theory of Acids and Bases

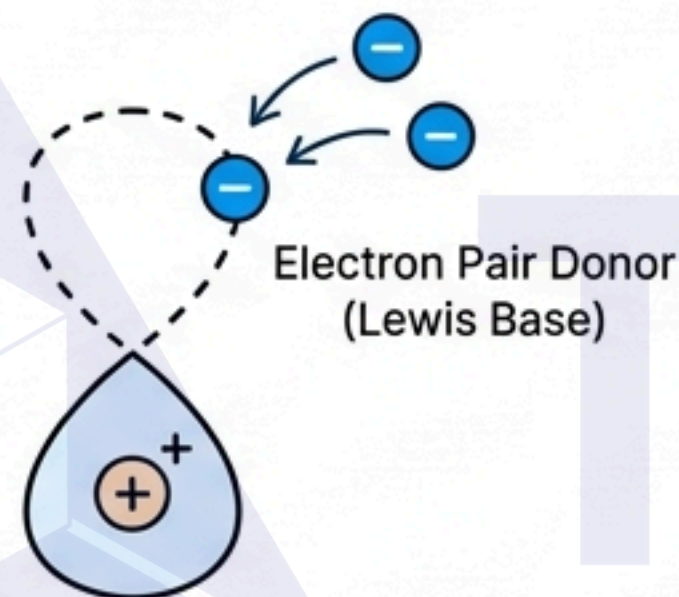


JEE Advanced Concept Builder

What is a Lewis Acid?

The Acceptor

A Lewis Acid is any chemical species that accepts an electron pair.



i Unlike Brønsted-Lowry acids, they do not need a proton (H^+). They only require an empty orbital to accommodate electrons.

JEE Snapshot: Lewis Acids



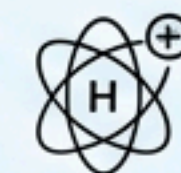
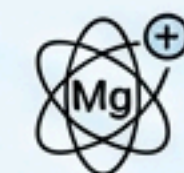
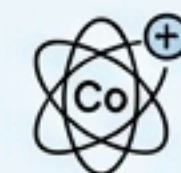
Electron Deficient Molecules
(Incomplete octets)



BF_3 , AlCl_3 , BCl_3



Simple Cations
(Positive charge attracts electrons)

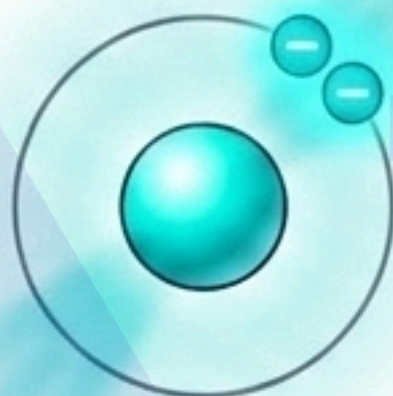


Co^{3+} , Mg^{2+} , H^+

What is a Lewis Base?

The Donor

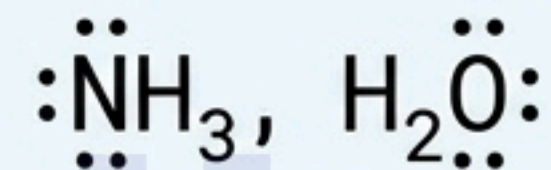
A Lewis Base is any chemical species that donates an electron pair.



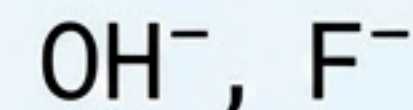
i This aligns closely with the Brønsted-Lowry definition (both provide lone pairs), but expands the scope of what the base can react with.

JEE Snapshot: Lewis Bases

Neutral Molecules
(Must possess lone pairs)



Anions
(Electron-rich species)





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

$$E=mc^2$$



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Key Highlights

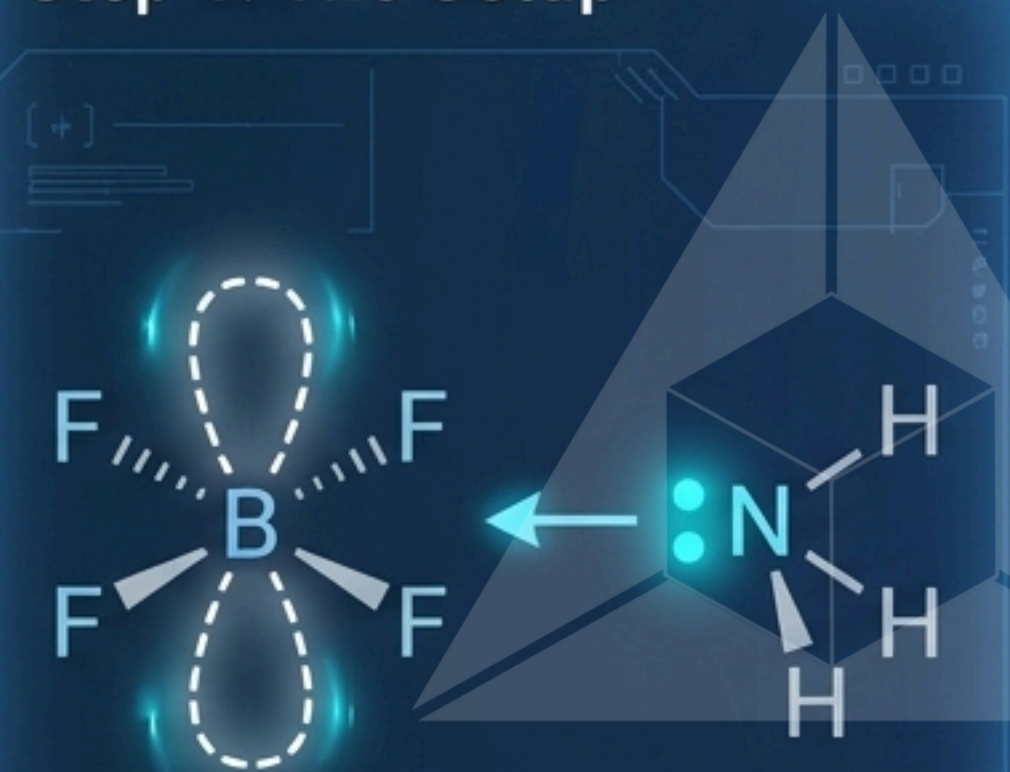
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The Mechanism: Coordinate Bond Formation



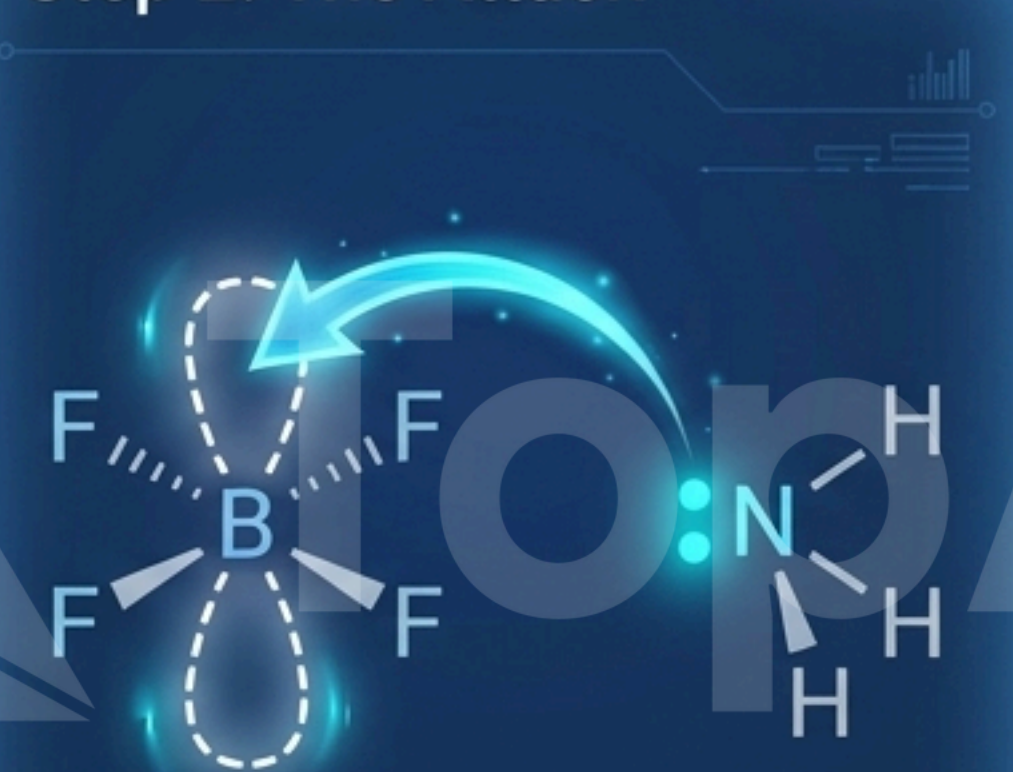
Step 1: The Setup



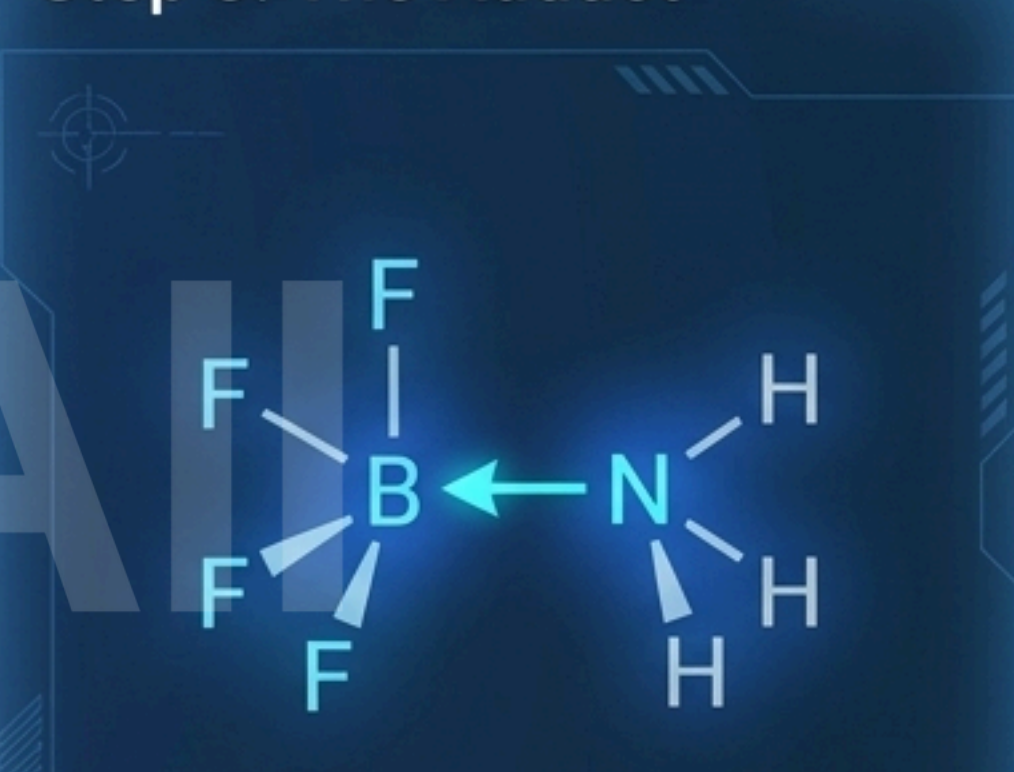
Lewis Acid /
Electron Deficient

Lewis Base /
Lone Pair

Step 2: The Attack



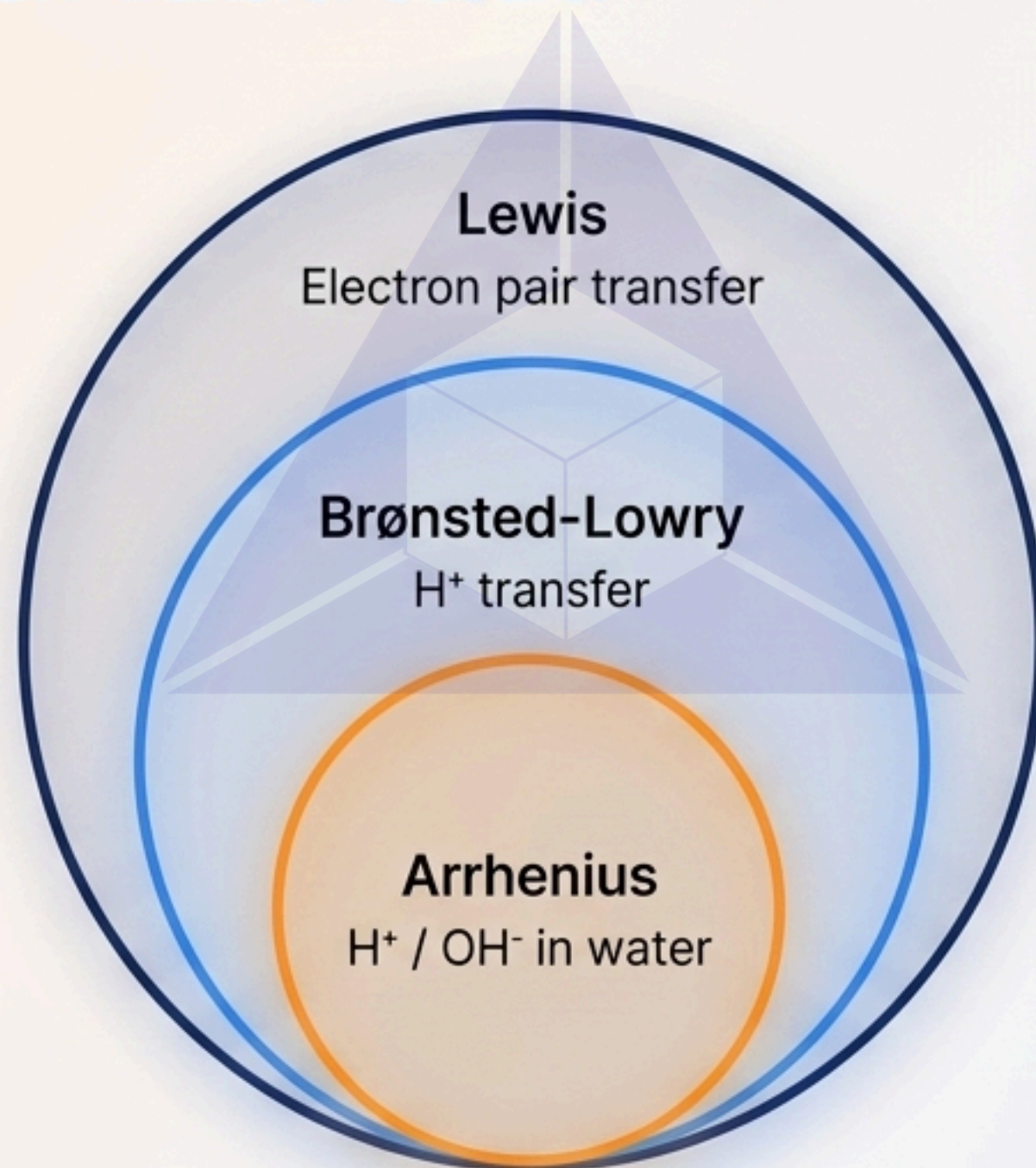
Step 3: The Adduct



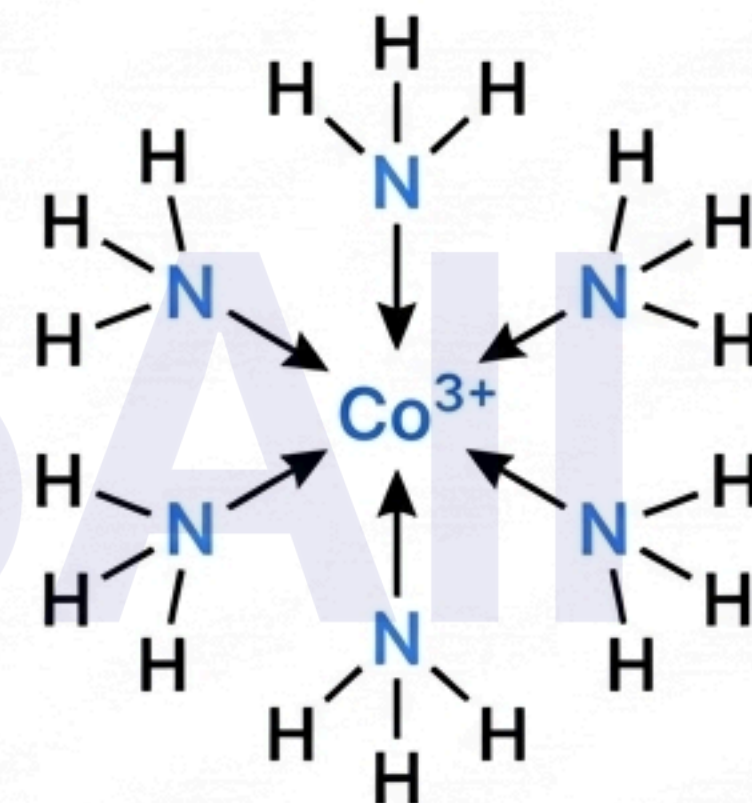
A coordinate covalent (dative) bond
forms. Both electrons originate
entirely from Nitrogen.

Why Do We Need Lewis Theory?

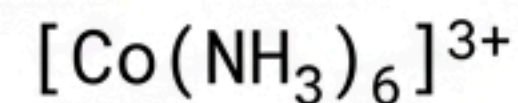
It explains reactions where absolutely zero H^+ or OH^- transfer occurs.



Coordination Chemistry Foundation



Central metal ion (Co^{3+}) acts as the Lewis Acid
Surrounding ligands (NH_3) act as Lewis Bases



The 'Hydrogen-Only' Fallacy



The Trap

Assuming a species **MUST** contain Hydrogen to act as an acid.

Which of the following is **NOT** an acid?

A) HCl, B) H_2SO_4 , C) BF_3 , D) HNO_3



The Truth

BF_3 IS an acid! According to G.N. Lewis, acids are electron pair acceptors. Species like BF_3 and AlCl_3 are powerful Lewis acids despite having zero hydrogen atoms.

In the exam, look for incomplete octets and empty orbitals, not just protons!

Exam Snapshot: Lewis Theory

✓ The Core Definition

Lewis Acid:	Electron Pair Acceptor	(Empty orbitals, Cations → e.g., BCl_3 , H^+)
Lewis Base:	Electron Pair Donor	(Lone pairs, Anions → e.g., NH_3 , F^-)

✓ The Bond

Lewis Acid-Base reactions always result in the formation of a Coordinate Covalent Bond (Dative bond).

✓ The Advantage

Explains acidity in completely non-protonic systems and forms the structural foundation of Coordination Chemistry.



You've Learned the Theory.

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