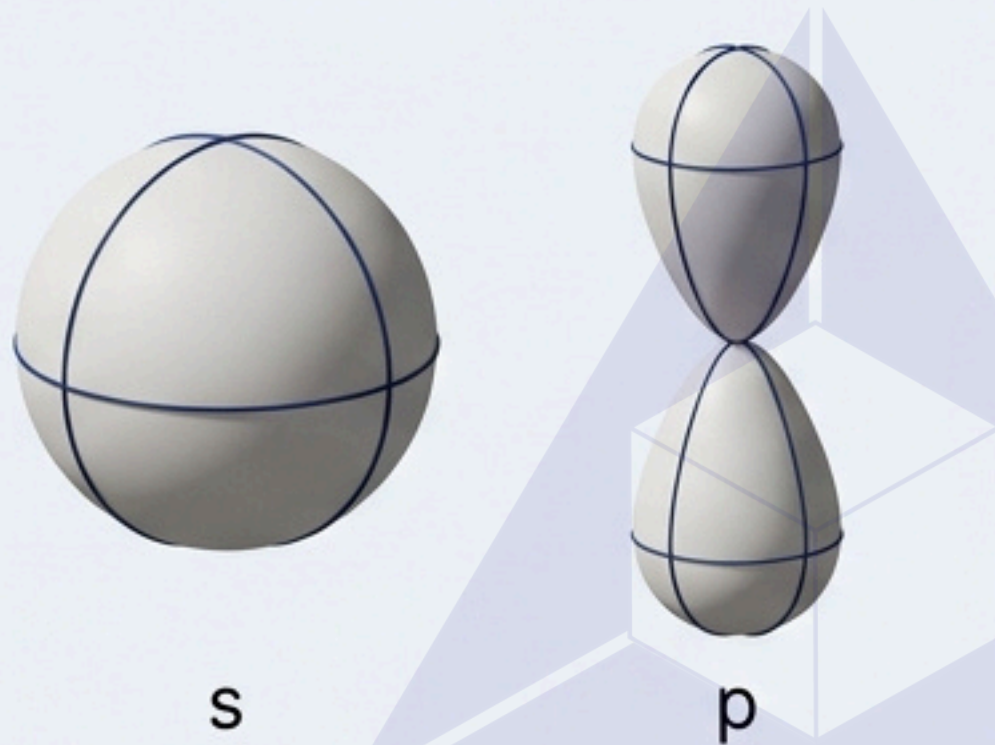


The Architectural Blueprints of Molecules

Raw Materials

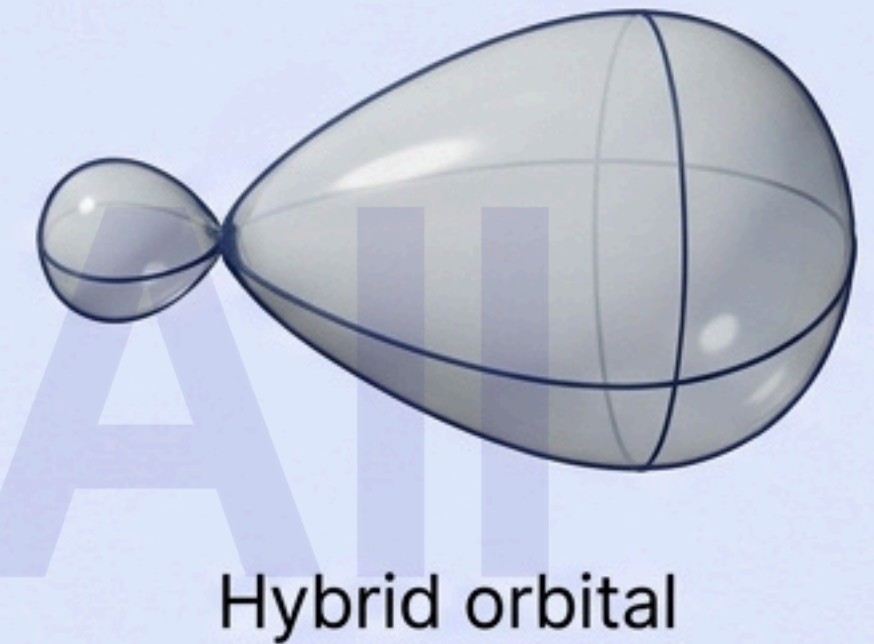


Remelting & Recasting



(Energy Redistribution)

The Blueprint

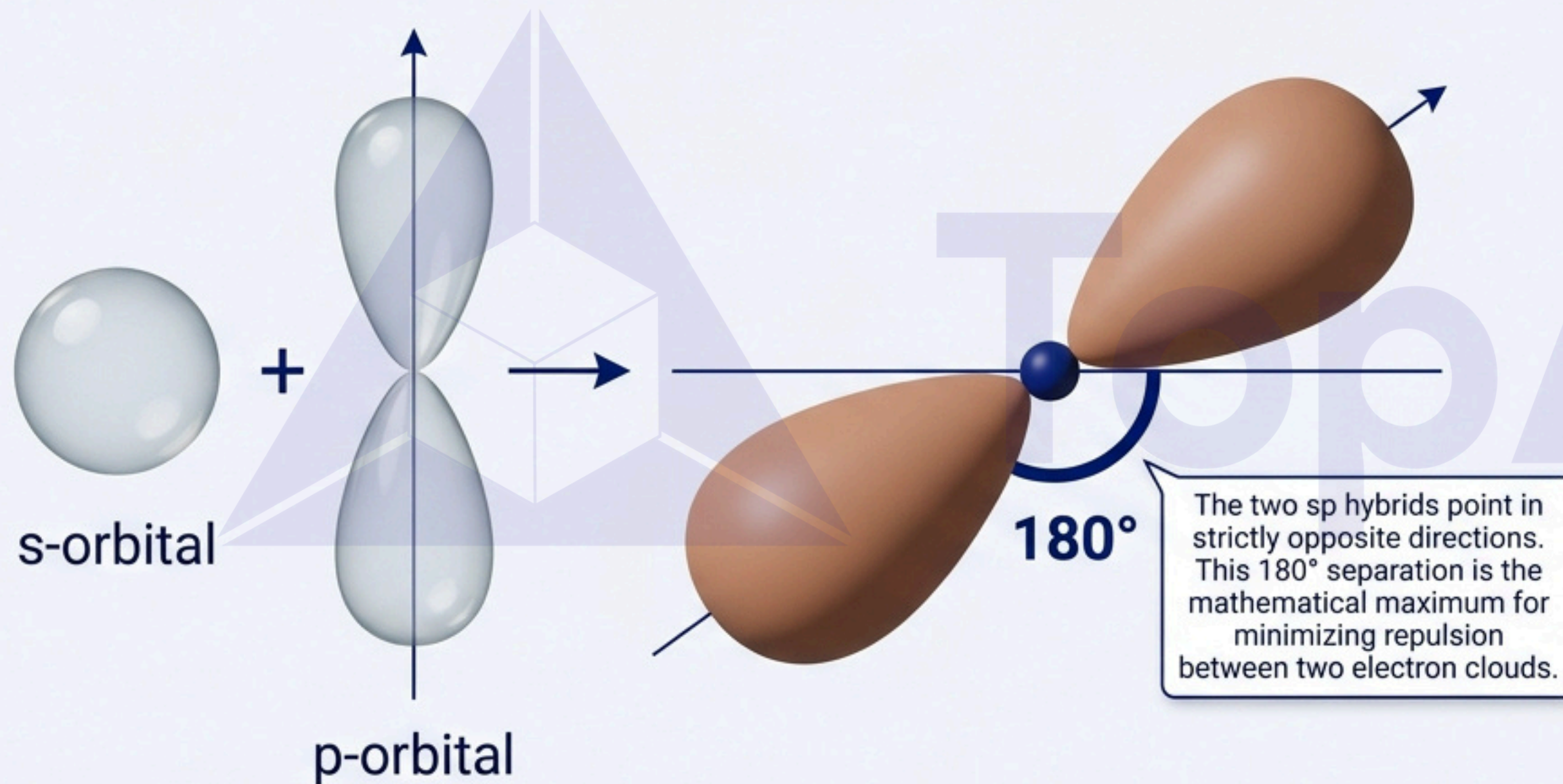


1. Conservation of Orbitals: Number of atomic orbitals mixed = Number of hybrid orbitals formed.

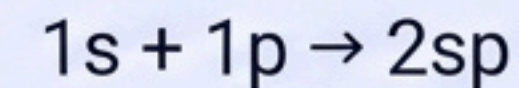
2. Total Equivalence: New hybrid orbitals are completely identical in energy and shape.

3. Spatial Architecture: Hybrids orient themselves in space to minimize electron repulsion, defining the molecule's exact geometry.

sp Hybridisation: The 1D Linear Scaffold



Recipe:



Character:

50% s, 50% p

Geometry:

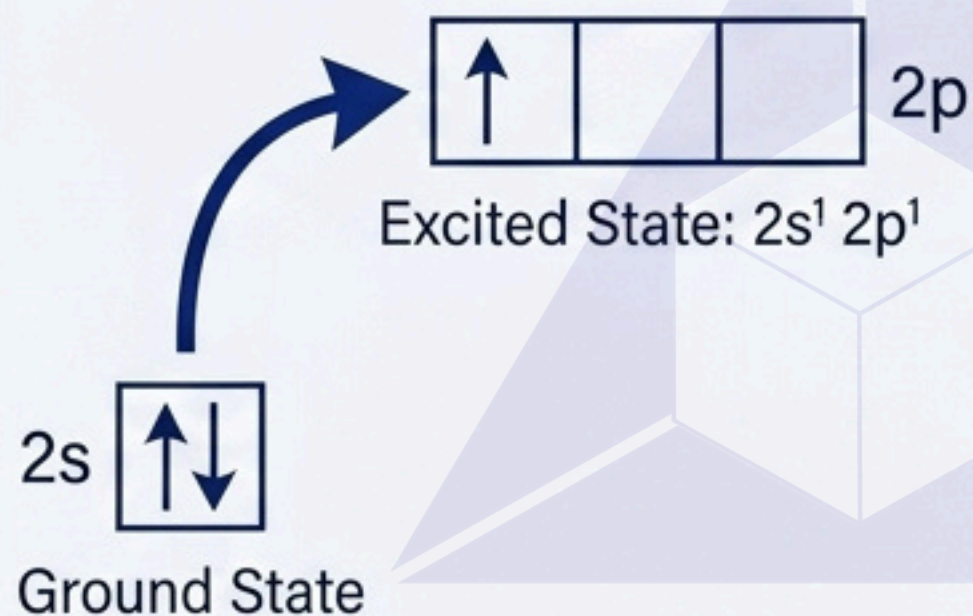
Linear

Bond Angle:

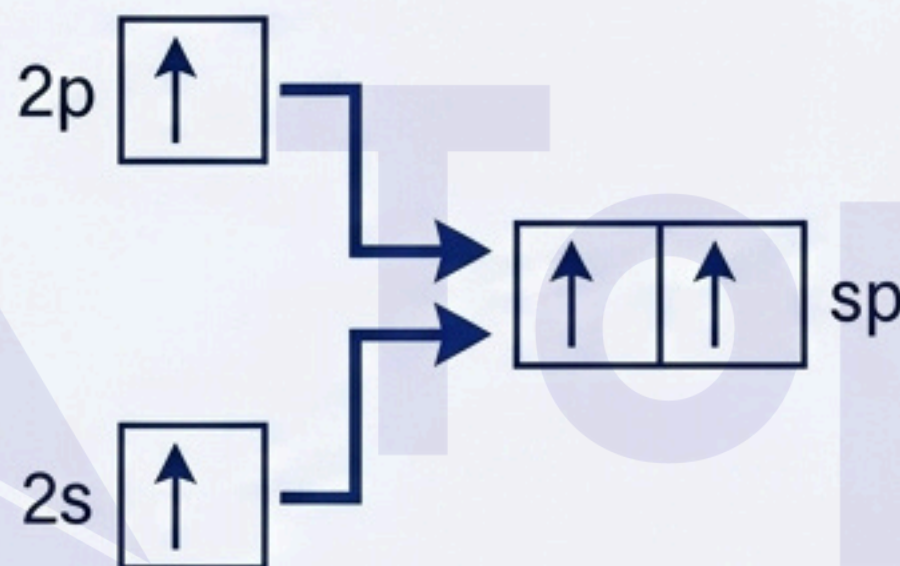
180°

Constructing BeCl_2 in 1D Space

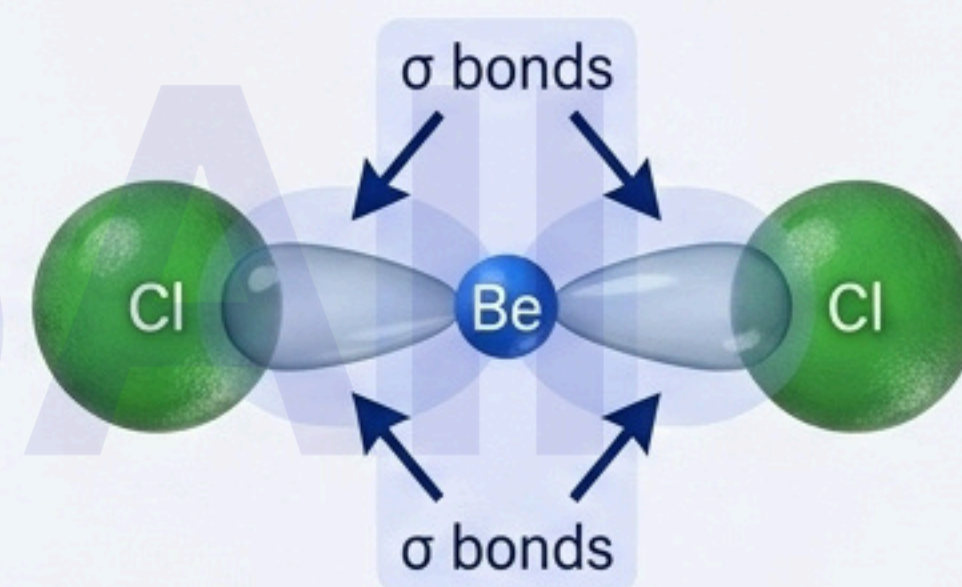
Step 1: Promotion



Step 2: Hybridisation



Step 3: Overlap



Takeaway: The molecule is perfectly linear. The 1D 180° blueprint holds true.



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

$$E=mc^2$$



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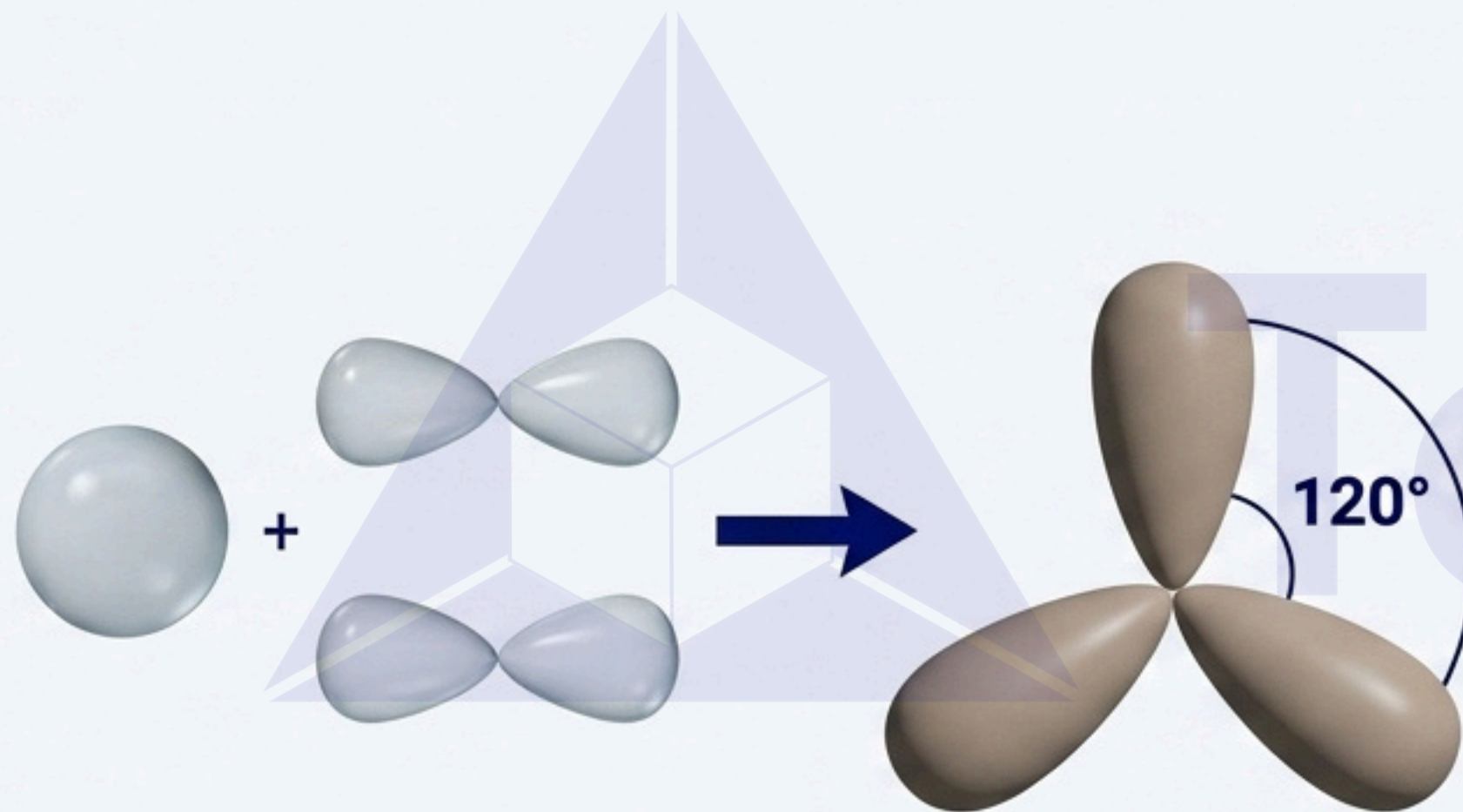
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Key Highlights

- » 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



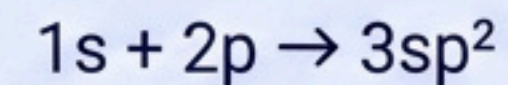
sp^2 Hybridisation: The 2D Flat Plane



All three orbitals fan out flat along a single 2D plane.

120° provides the maximum possible breathing room for three electron pairs.

Recipe:



Character:

33.3% s, 66.6% p

Geometry:

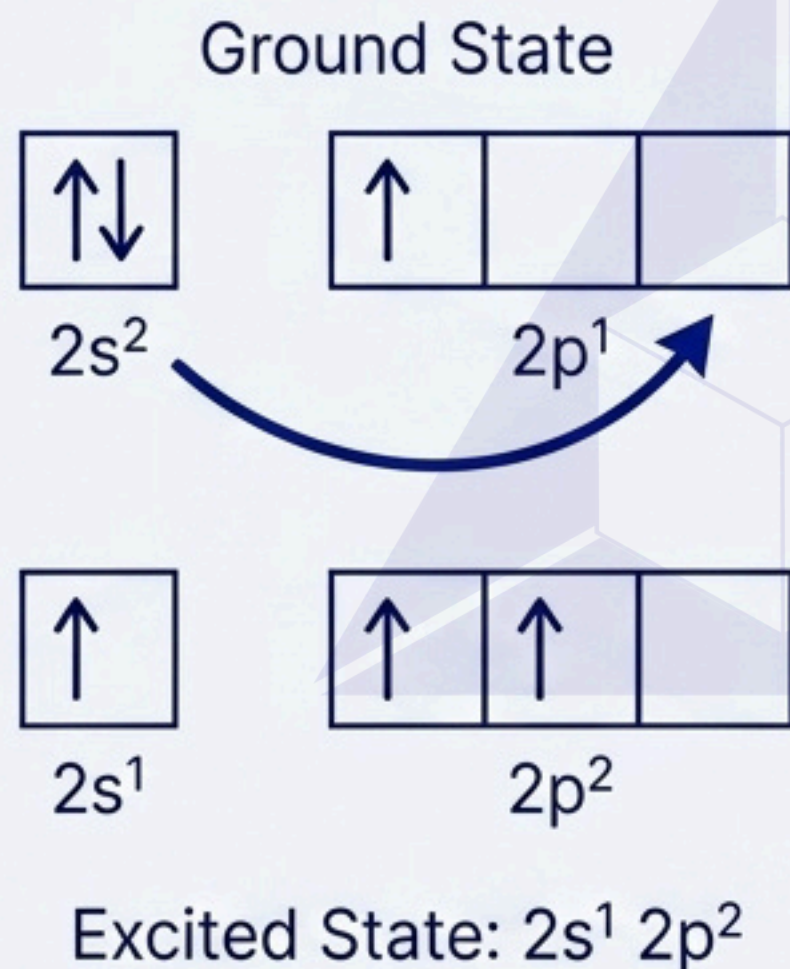
Trigonal Planar

Bond Angle:

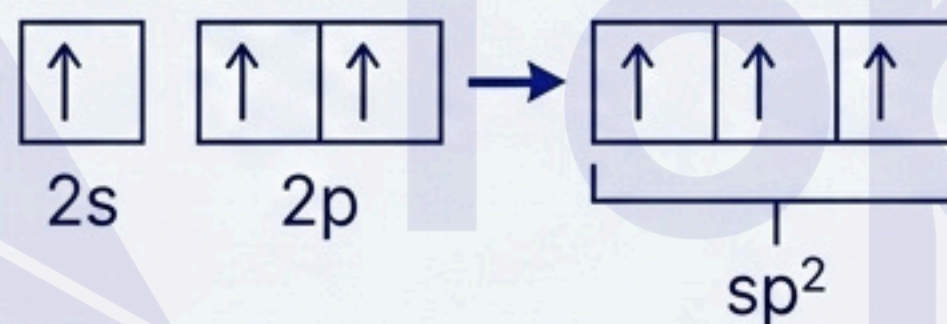
120°

Constructing BCl_3 in 2D Space

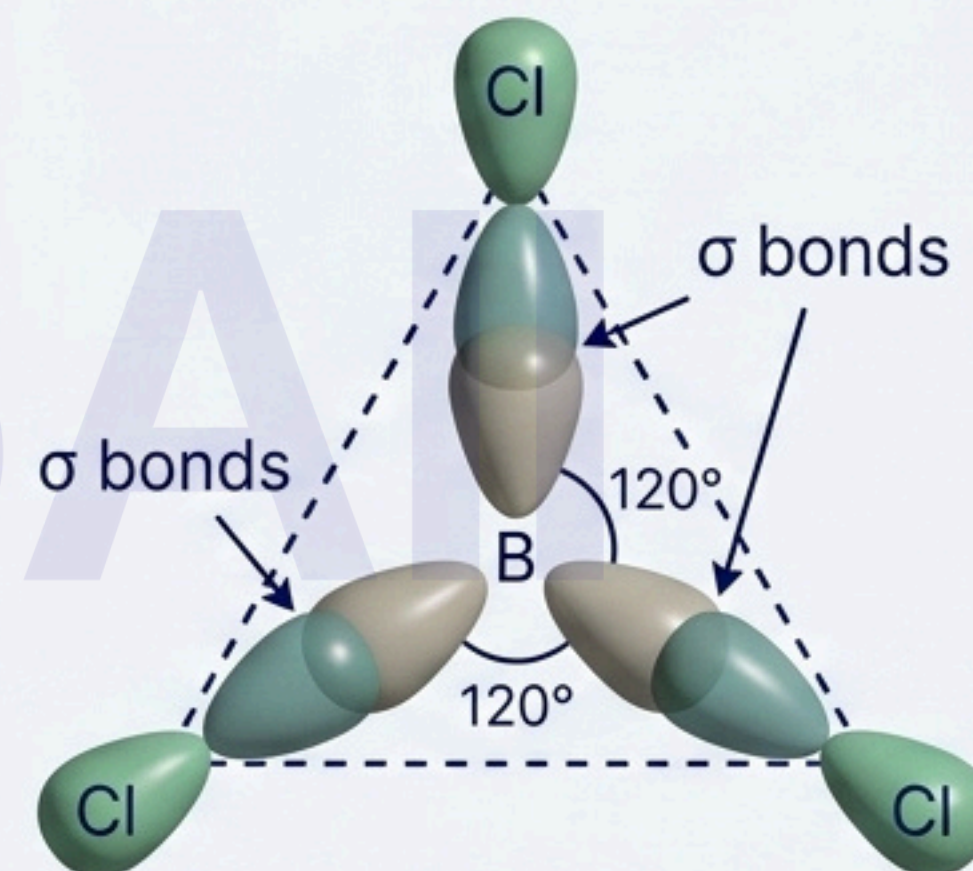
Step 1: Promotion



Step 2: Hybridisation

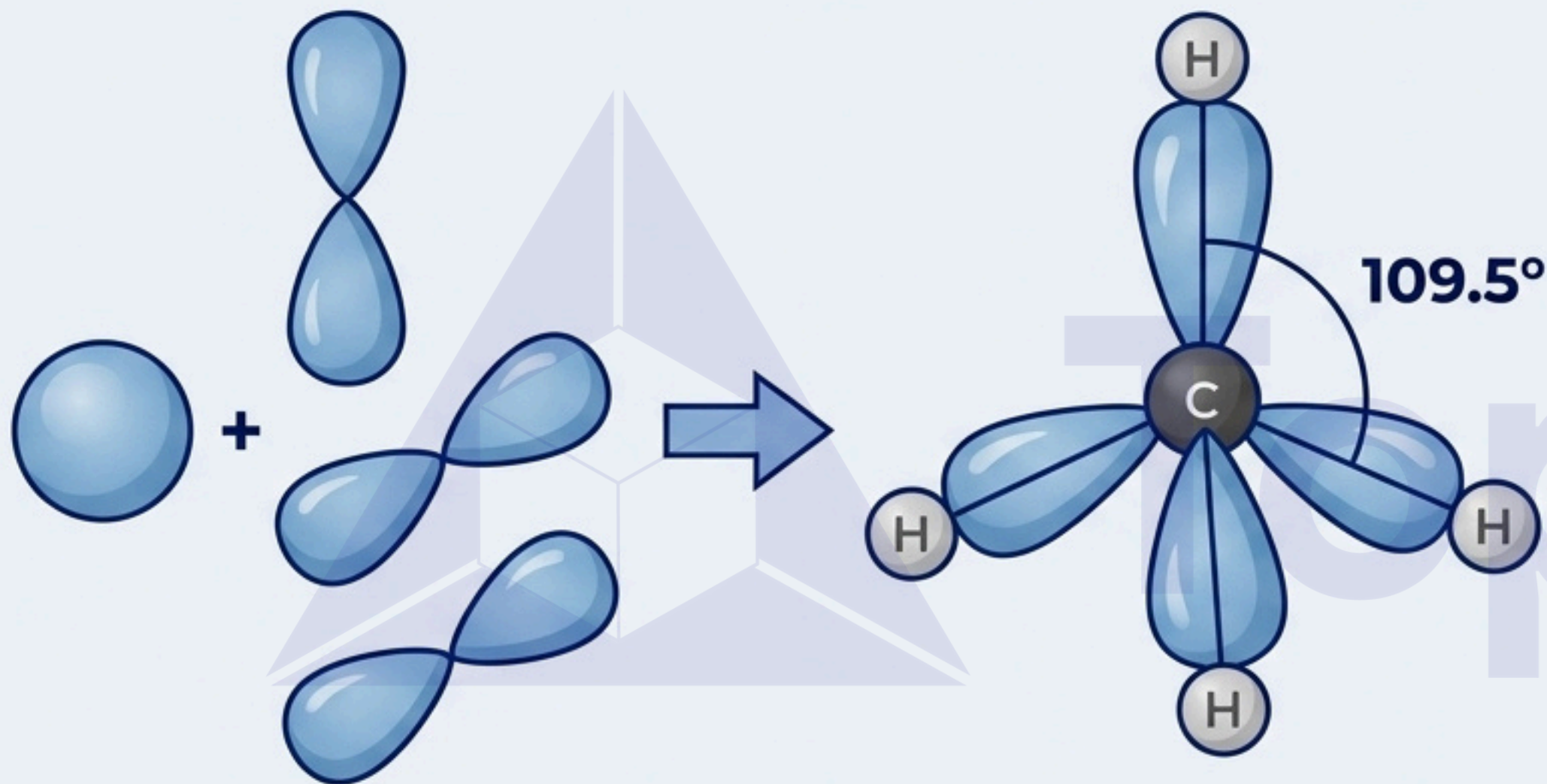


Step 3: Overlap



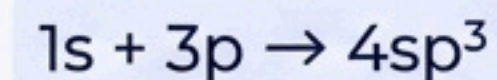
Takeaway: The resulting shape is a perfect, flat triangle with exactly 120° between every B—Cl bond.

sp^3 Hybridisation: Escaping into 3D



Simple atomic overlap would force 90° angles. sp^3 hybridisation allows the molecule to escape 2D flatland, expanding into a **3D tetrahedron** to achieve **109.5°** separation.

Recipe:



Character:

25% s, 75% p

Geometry:

Tetrahedral

Bond Angle:

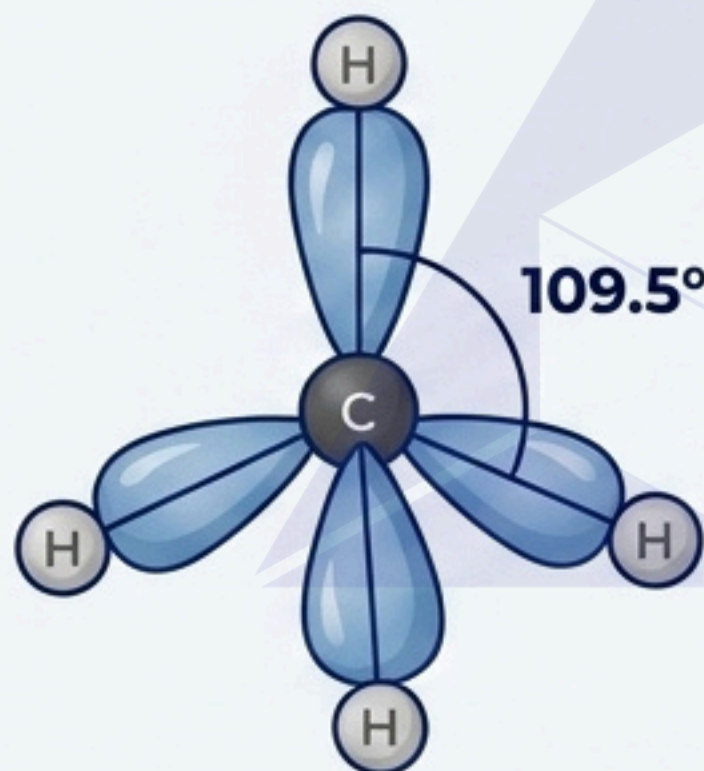
109.5°

The Distortion of 3D Architecture

How non-bonding lone pairs squeeze molecular geometry.

Methane (CH₄)

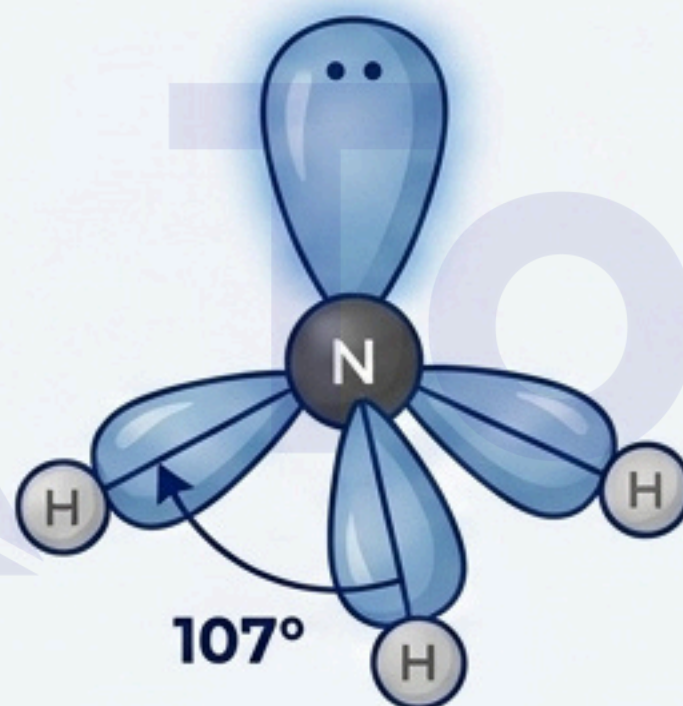
4 bond pairs, 0 lone pairs.



Perfect symmetry.

Ammonia (NH₃)

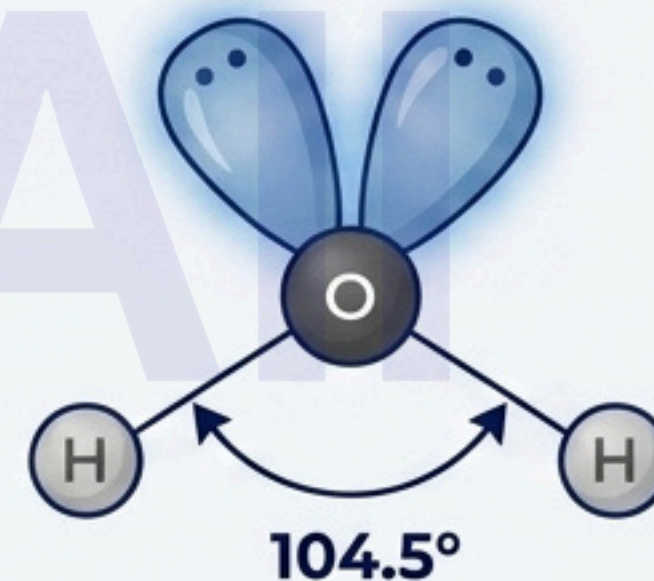
3 bond pairs, 1 lone pair.



Pyramidal distortion.
(lp-bp repulsion > bp-bp).

Water (H₂O)

2 bond pairs, 2 lone pairs.



Angular/Bent distortion.
(lp-lp repulsion is strongest).

Repulsion Hierarchy: Lone Pair-Lone Pair > Lone Pair-Bond Pair > Bond Pair-Bond Pair.

Revision Frame: Hybridisation Diagnostic Matrix

Type	Orbitals Mixed	% s-Character	Base Geometry	Ideal Angle	Key Example
sp	1s + 1p	50%	Linear 	180°	BeCl ₂
sp ²	1s + 2p	33.3%	Trigonal Planar 	120°	BCl ₃
sp ³	1s + 3p	25%	Tetrahedral 	109.5°	CH ₄

Cheat Sheet

If central atom has lone pairs, base geometry distorts (e.g., sp³ becomes Pyramidal or Bent) because lone pairs demand more spatial volume.



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