

UNIT 5 • COORDINATION COMPOUNDS

Geometric Isomerism

The Spatial Blueprint of Coordination Complexes

The Core Lexicon

Cis / Trans

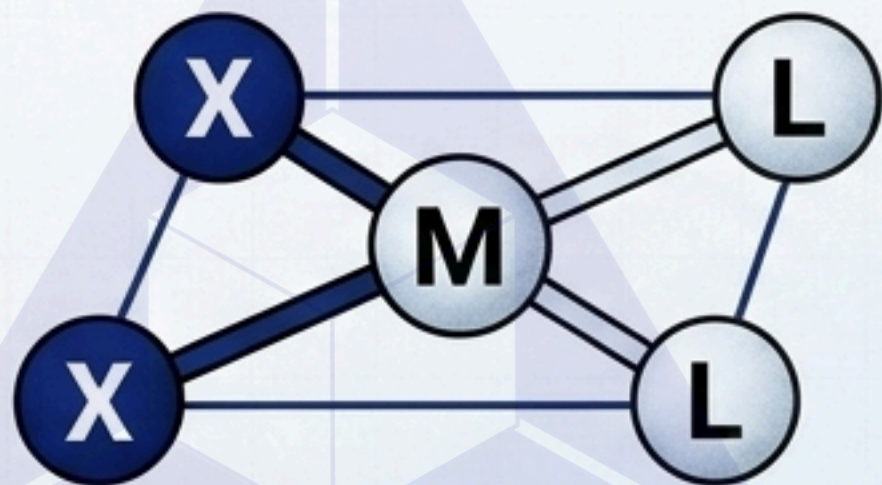
Adjacent (90°) vs.
Opposite (180°)

**Facial (fac) /
Meridional (mer)**

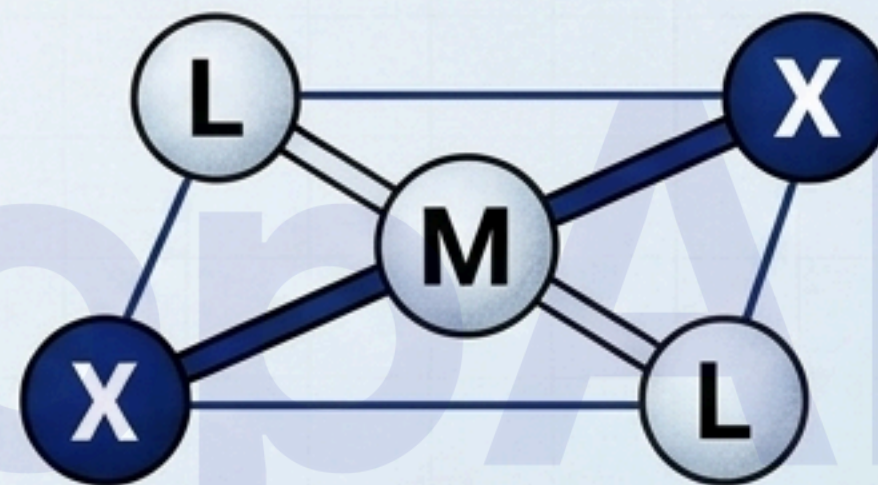
Triangular Face vs.
Equatorial Meridian

Coordination Number 4: Square Planar

[MX₂L₂]



Cis (Adjacent)



Trans (Opposite)



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$$E=mc^2$$



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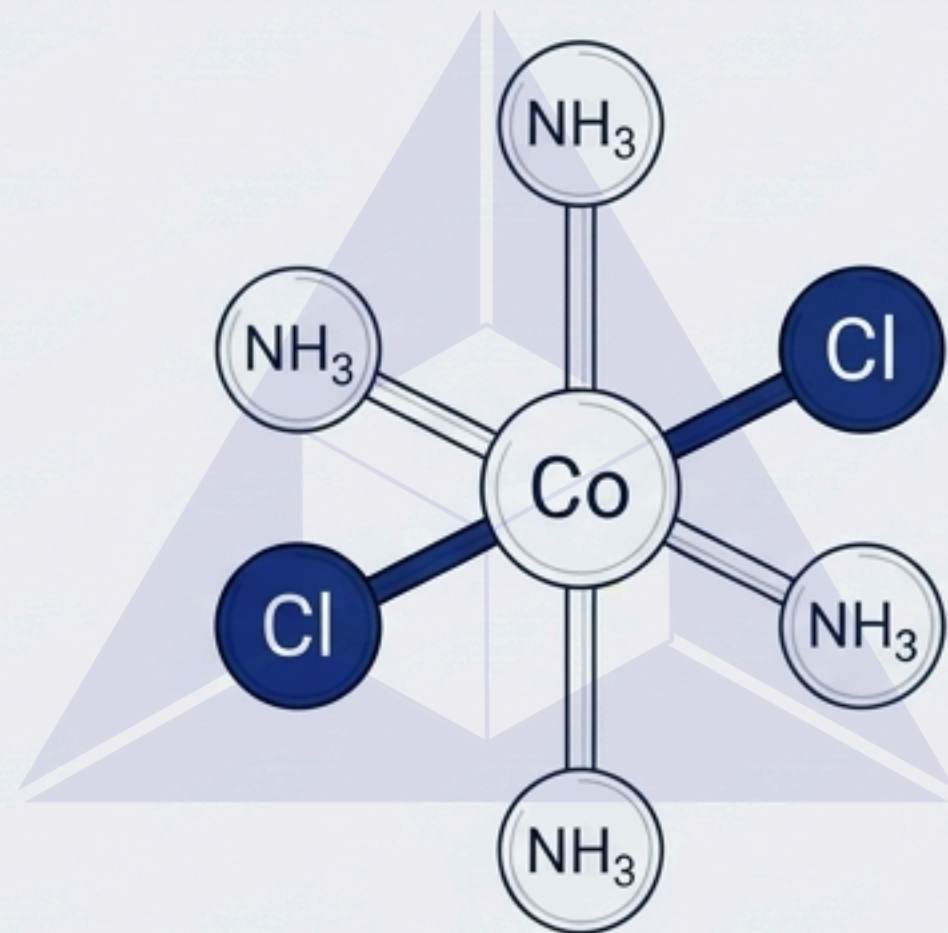
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Key Highlights

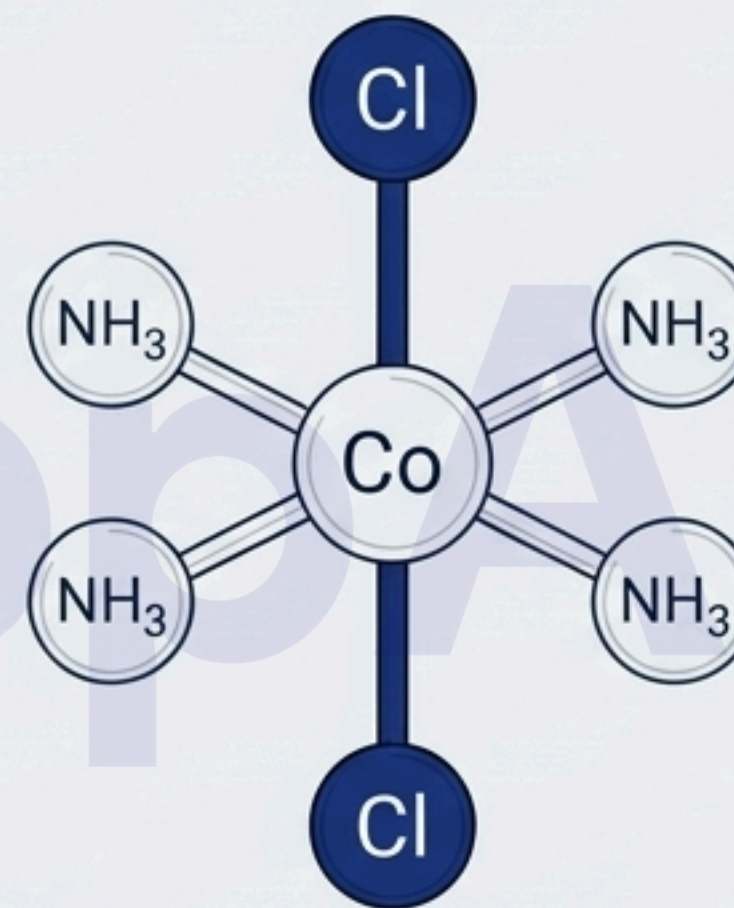
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Coordination Number 6: Octahedral [MX₂L₄]

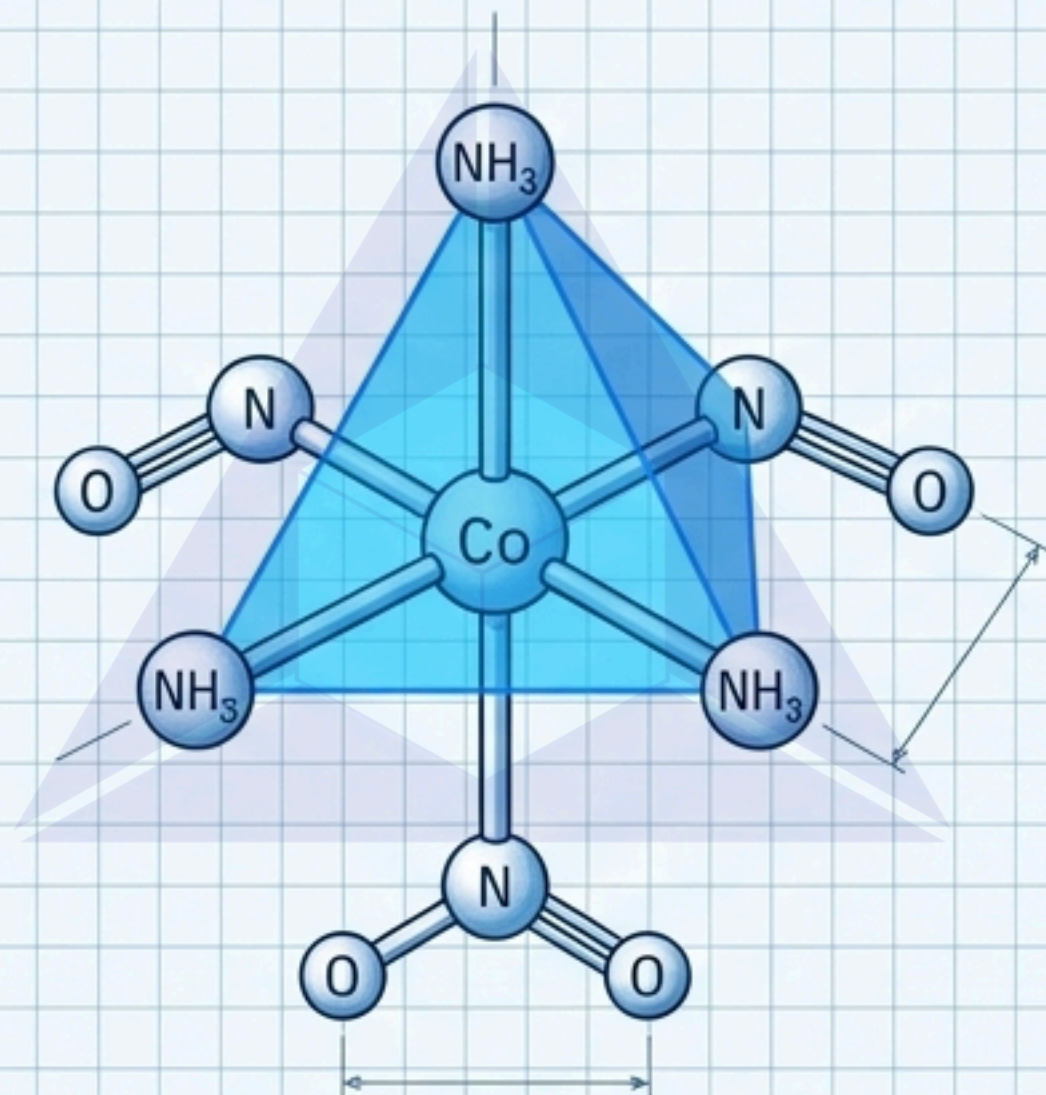
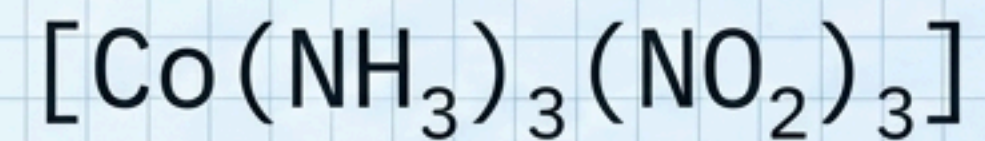


Cis (Adjacent in 3D)

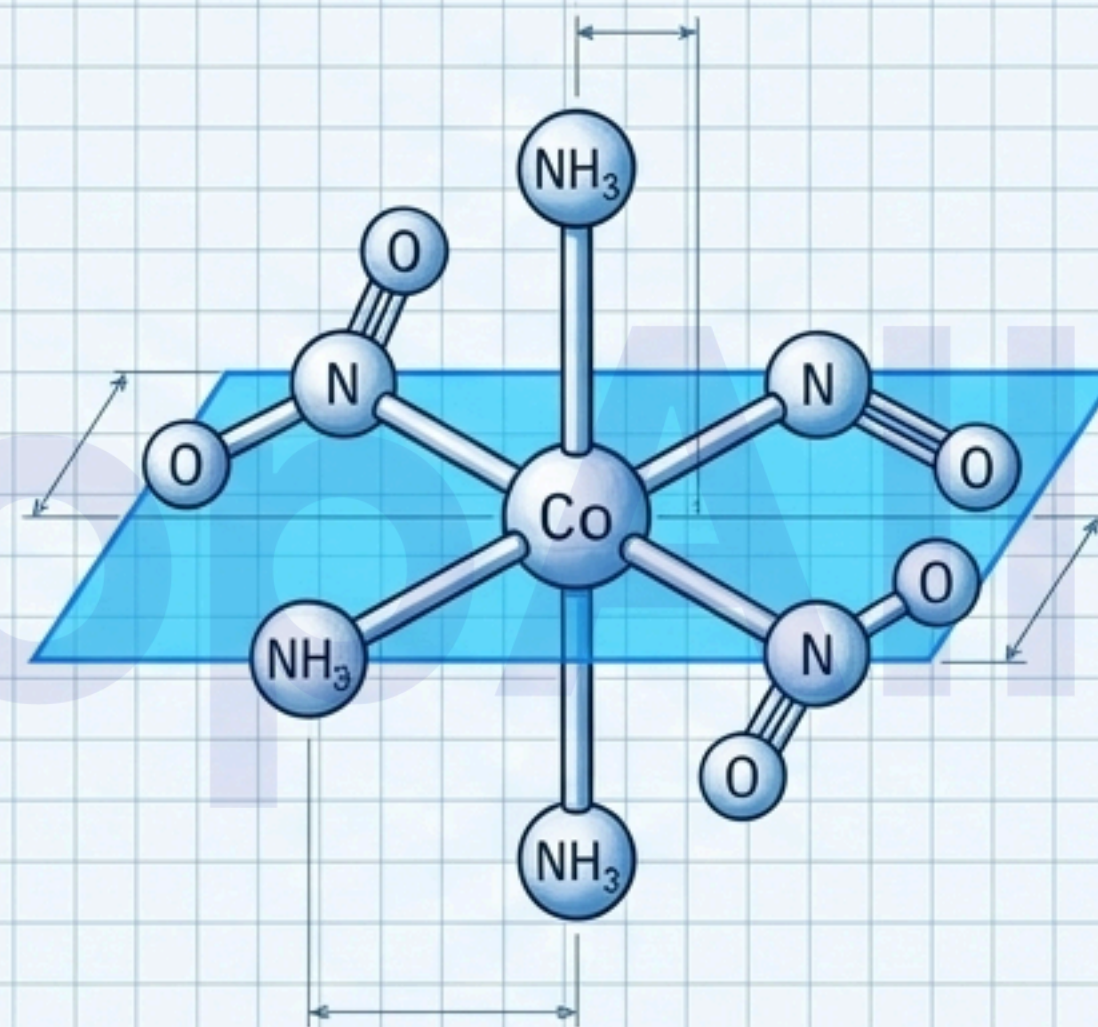


Trans (Opposite across metal)

The $[Ma_3b_3]$ Octahedral Spotlight



fac-isomer (Occupies a triangular face)



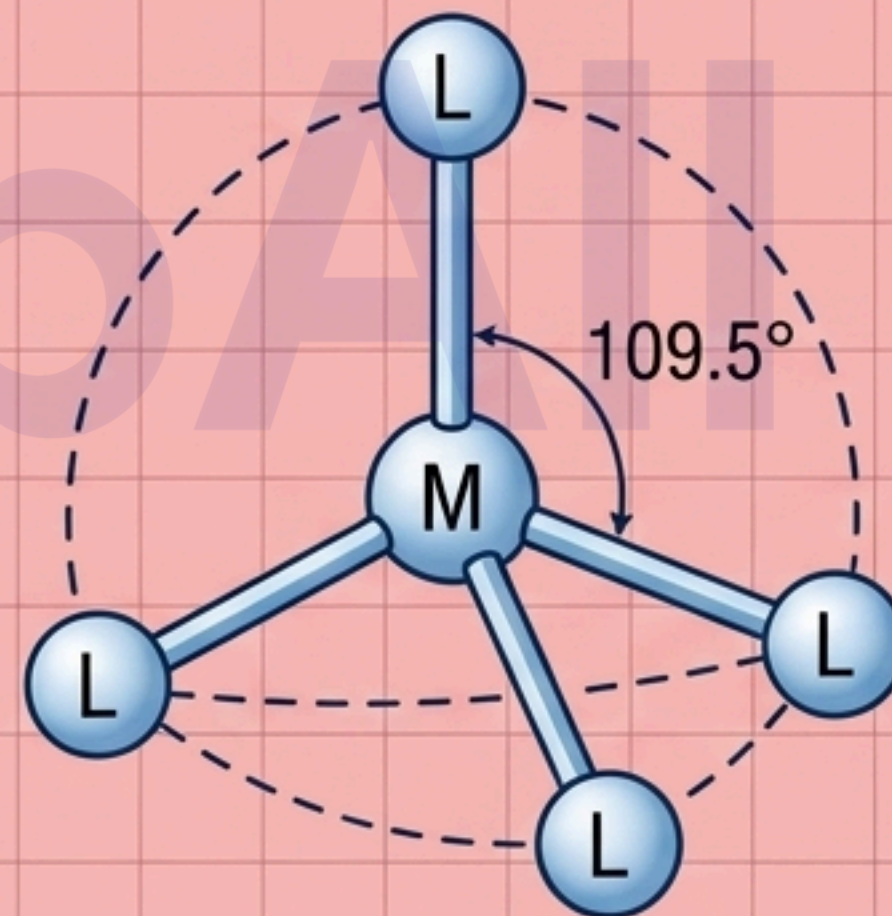
mer-isomer (Bisects the meridian)

Exam Reference: Isomer Count Matrix

Formula	Geometry	Isomers
[MX ₂ L ₂]	Square Planar	2 (cis, trans)
MABXL	Square Planar	3 (2 cis, 1 trans)
[Ma ₃ b ₃]	Octahedral	2 (fac, mer)
Any	Tetrahedral	0

Watch for this: Tetrahedral geometry NEVER shows geometric isomerism.

- Because all positions in a tetrahedron are exactly 109.5° apart, every position is adjacent. There is no 'opposite' position to create a trans isomer.



Key Takeaways

- Geometric isomerism is strictly about spatial arrangement: cis/trans for $[MX_2L_2]$ & $[MX_2L_4]$, and fac/mer for $[Ma_3b_3]$.
- Always check coordination geometry first: Square planar and octahedral permit geometric isomers; tetrahedral complexes never do.



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