

The background features a large, faint geometric shape, possibly a dodecahedron or a complex polyhedron, rendered in light blue lines. A semi-transparent grey banner is positioned across the middle of the image.

UNIT 5 • COORDINATION COMPOUNDS

Optical Isomerism

Understanding chiral coordination entities, mirror images, and the rotation of polarized light.

The Language of Chirality

ENANTIOMERS

Optical isomers that are exact mirror images of each other but cannot be superimposed.

CHIRAL

Molecules or ions that lack an internal plane of symmetry, making them non-superimposable on their mirror image.

DEXTRO / LAEVO

Designations for how a chiral molecule rotates plane-polarized light: right (d) or left (l).



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$$E=mc^2$$



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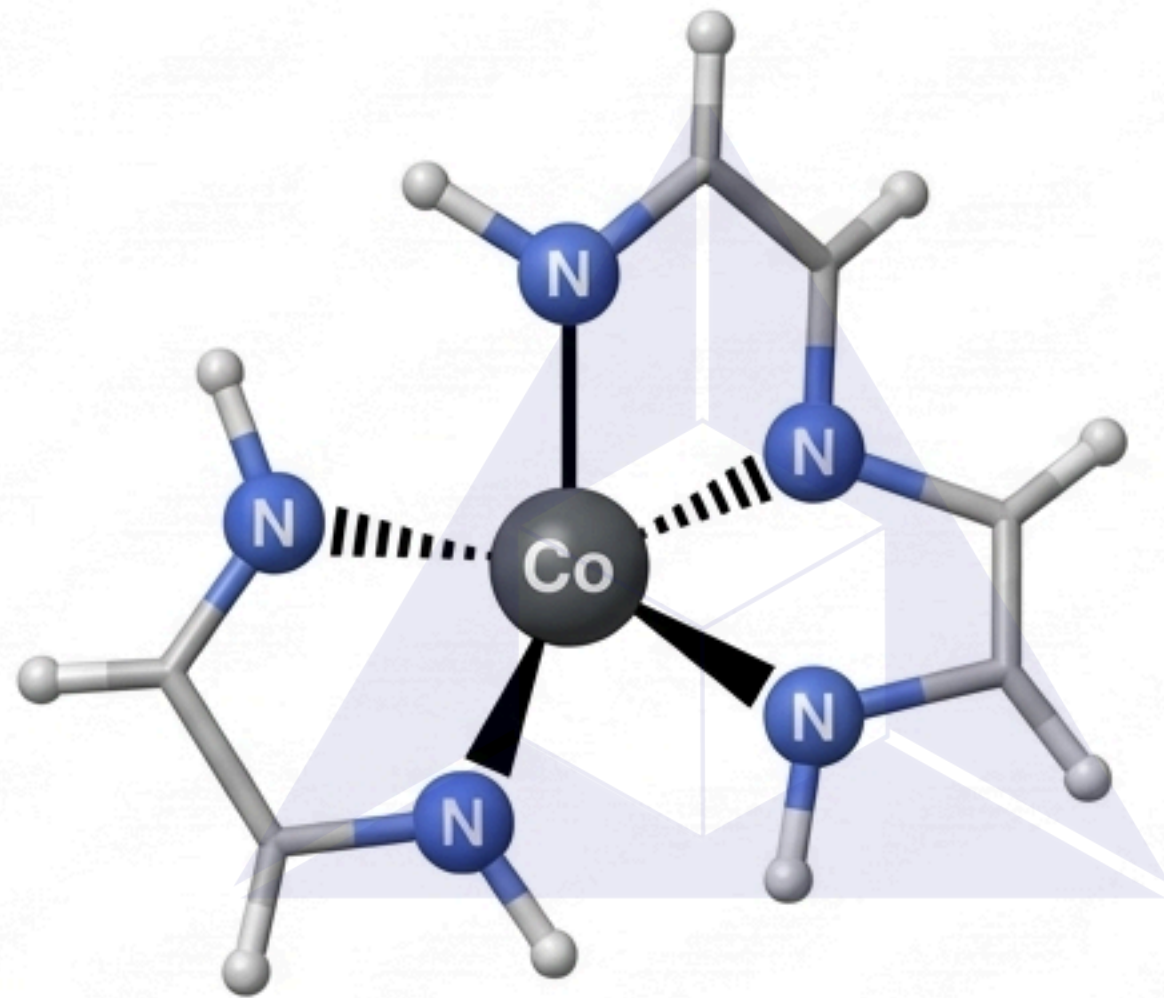
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Key Highlights

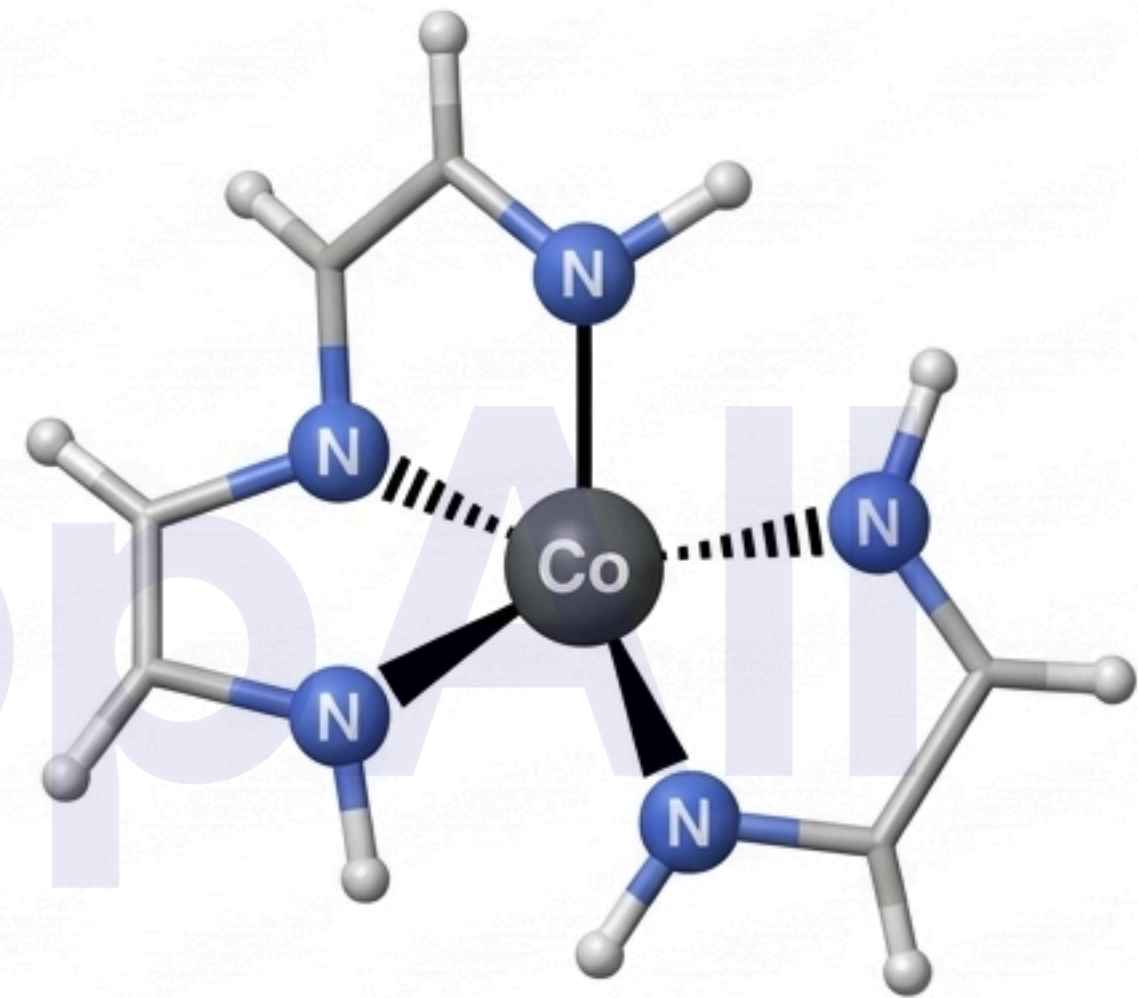
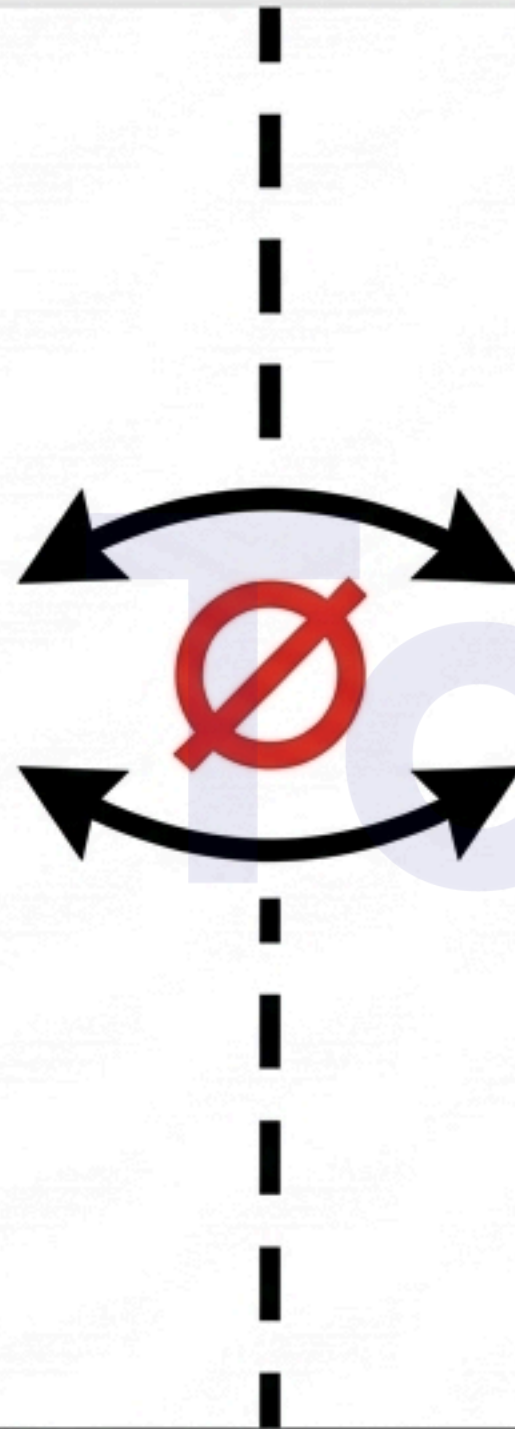
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Non-Superimposable Mirror Images



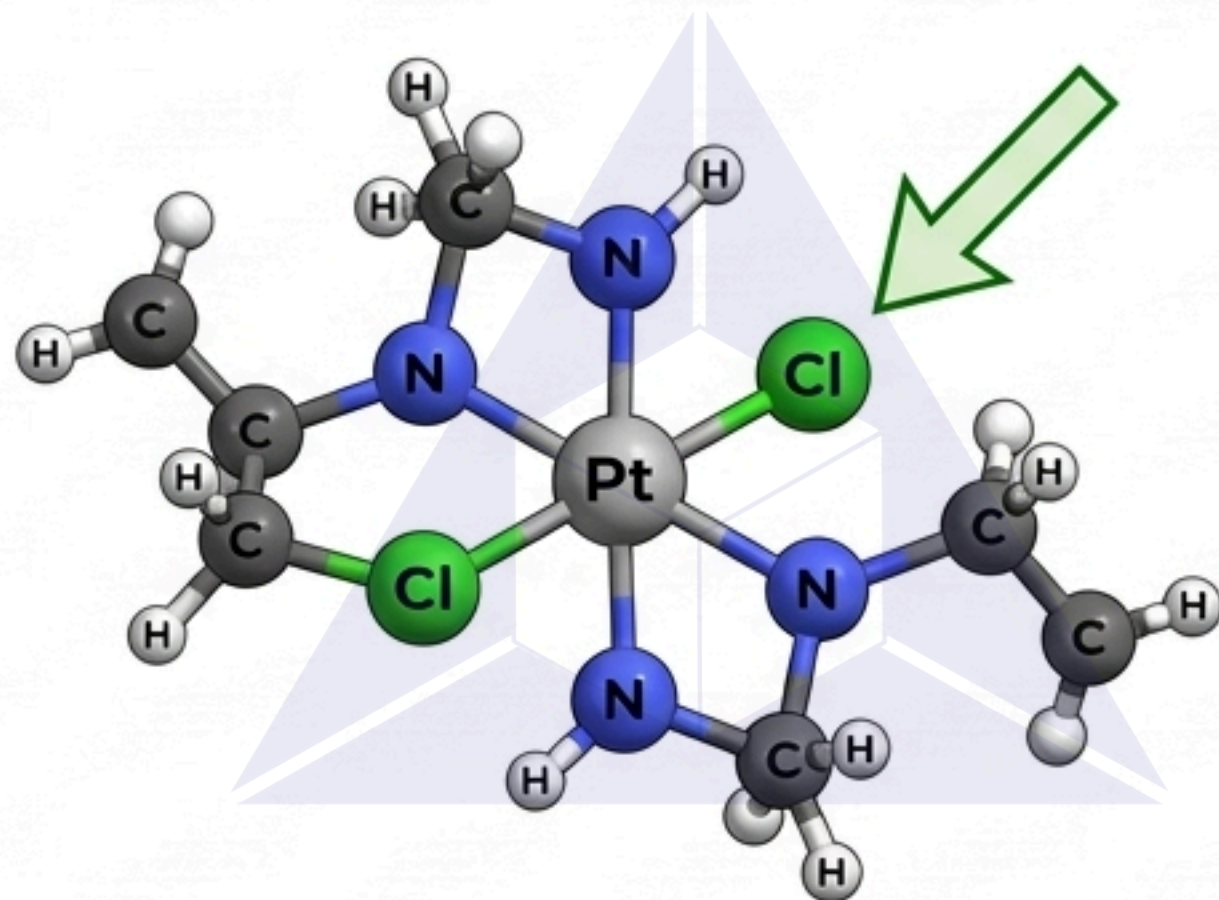
$d-[Co(en)_3]^{3+}$



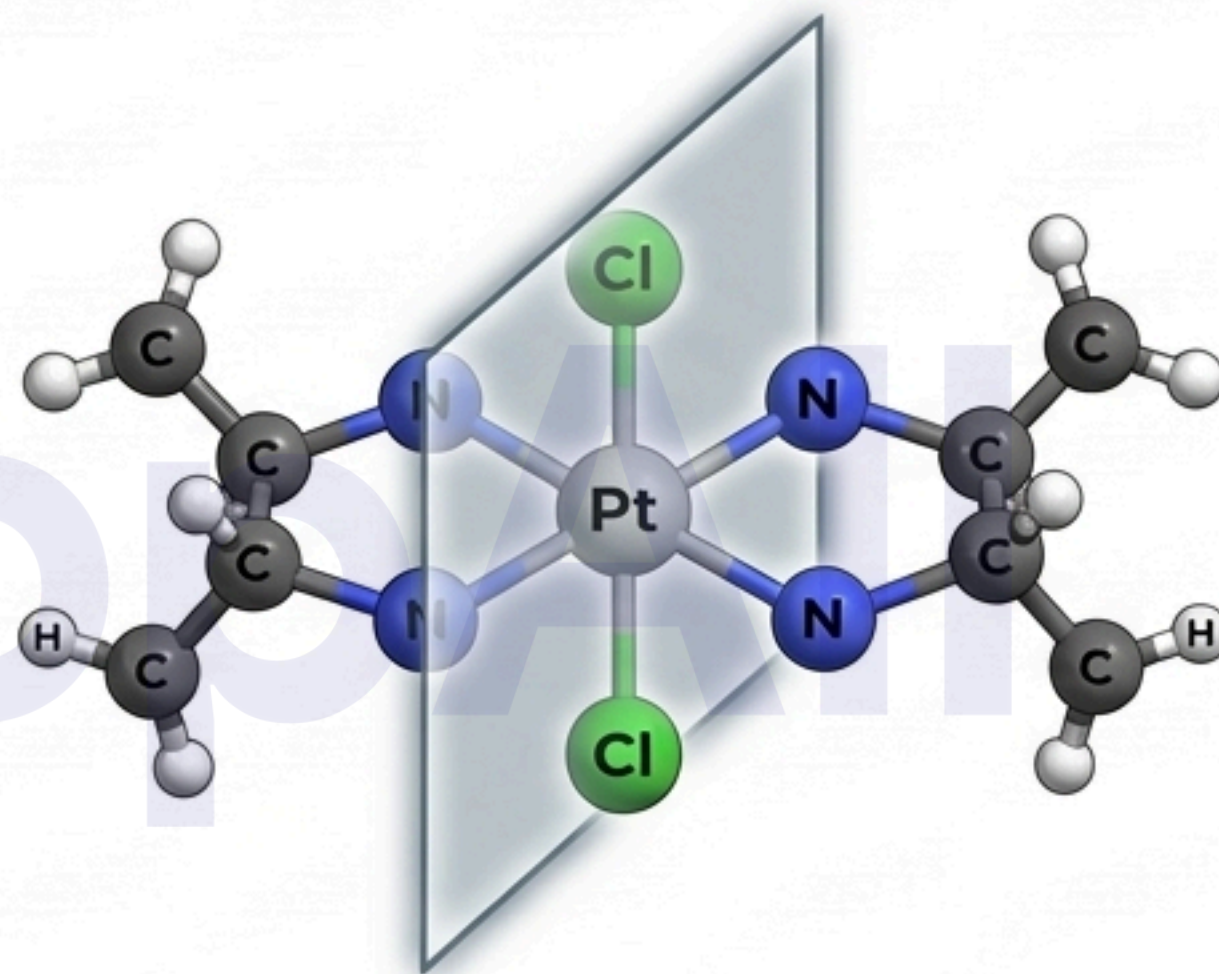
$l-[Co(en)_3]^{3+}$

Because the complex contains didentate ligands (en) arranged asymmetrically, the two forms are chiral.

Diagnosing Chirality: Cis vs. Trans



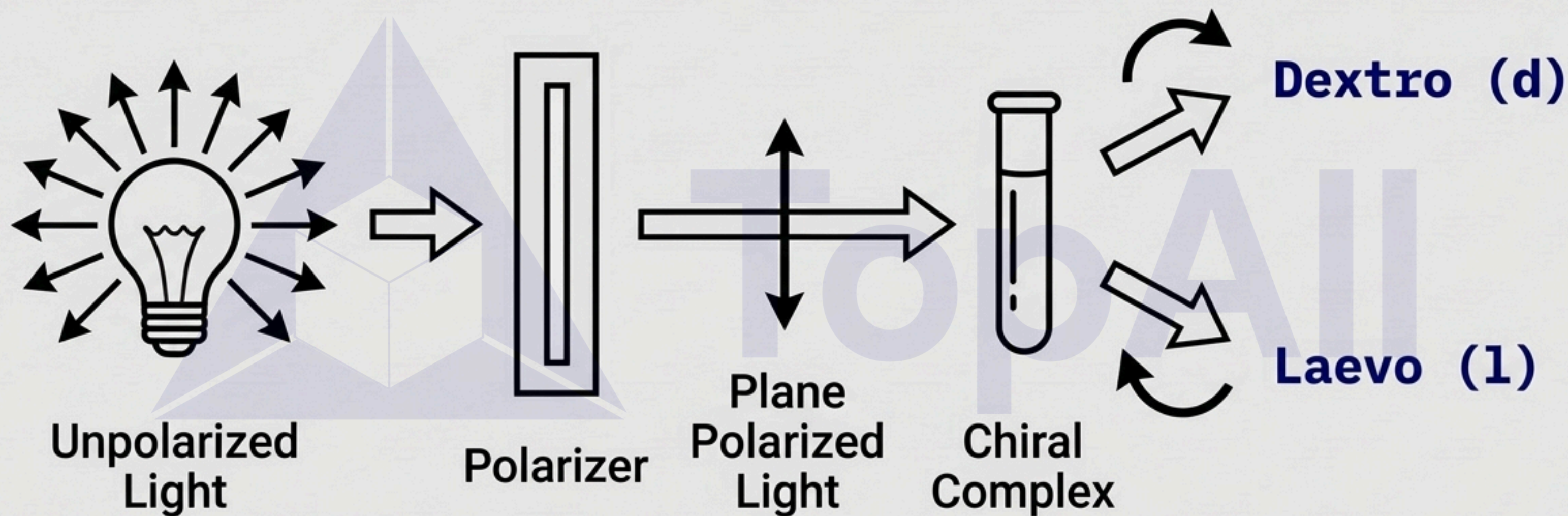
OPTICALLY ACTIVE



OPTICALLY INACTIVE

To find if a complex is chiral, look for an internal plane of symmetry. If it has one, it is achiral.

How Optical Isomerism is Measured



Enantiomers have identical physical properties—except for the direction they rotate plane-polarized light in a polarimeter.

Common Exam Trap

WATCH FOR THIS

You might assume all complex geometries with didentate ligands exhibit optical isomerism. However, only specific spatial configurations lack the required internal symmetry.

In the $[\text{PtCl}_2(\text{en})_2]^{2+}$ coordination entity, **only the *cis*-isomer is optically active**. The *trans*-isomer possesses an internal mirror plane, making it achiral.

Summary Summary

KEY TAKEAWAYS

- **Optical isomers** (enantiomers) are **non-superimposable mirror images**; they rotate plane-polarized light in opposite directions (dextro and laevo).
- **Chirality** relies on a **lack of internal symmetry**—meaning *cis* isomers of octahedral complexes with didentate ligands are often optically active, while *trans* isomers are generally achiral.



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