Coordination Number 2

The linear [Ag(NH₃)₂]⁺ ion

Although [Ag(en)]ClO₄ involves a normally bidentate ligand, in this case the structure is polymeric and the silver ion still retains a CN=2 with the N atoms (from different ligands) at ~180 degrees to each other.

Coordination Number 3

Trigonal planar - D₃h

[Cu(CN)₃]²⁻

[Cu(PPh₃)₂Br]

To help view more easily, the H atoms are turned off.

Trigonal pyramid

T-shaped

[Rh(PPh₃)₃]⁺

To help view more easily, the H atoms are turned off.

Coordination Number 4

Tetrahedral

Copyr₂Cl₂
Square Planar

cisplatin - cis-Pt(NH₃)₂Cl₂

The cis- isomer is a powerful anti-cancer drug whereas the trans- is inactive.

Coordination Number 5

Square pyramid

Trigonal Bipyramid

[ Ni(CN)₅ ]³⁻

Coordination Number 6

Hexagonal planar

Trigonal prism

tris(cis-1,2-diphenylethene-1,2-dithiolato)rhenium

The Re₆S₆ geometry is perfectly trigonal prismatic.

Octahedral

Hexol

The first 'truly' inorganic complex to be resolved into its optical isomers.

[Co(en)₃]Cl₃

mirror images

The classic example of optical isomerism in octahedral coordination complexes (H atoms not shown).
[Co(NH$_3$)$_5$CO$_3$]$^+$

**Coordination Number 7**

**Capped octahedron (C$_{3v}$)**

K$_3$[NbOF$_6$]

**Capped trigonal prism (C$_{2v}$)**

[V(III)(Hedta)(H$_2$O)]H$_2$O

**Pentagonal Bipyramid (D$_{5h}$)**

bis-(tert-butylacac)$_2$(DMSO)di-oxoUranium

The UO$_7$ geometry fits a pentagonal bipyramid.

**Coordination Number 8**

**Dodecahedron (D$_{2d}$)**

Zr(acac)$_2$(NO$_3$)$_2$

[Zr(C$_2$O$_4$)$_4$]$^{4-}$ is reported to have this shape as well.

**Cube (O$_h$)**

**Square antiprism (D$_{4d}$)**

U(acac)$_4$

**Hexagonal bipyramid (D$_{6h}$)**

UO$_2$(OAc)$_3$
Coordination Number 9

Three-face centred trigonal prism (D$_{3h}$)

Hydrated salts of the lanthanide elements eg Eu(H$_2$O)$_9^{3+}$

Coordination Number 10

Bicapped square antiprism (D$_{4d}$)

Tetrakis(nitrato-O,O')-bis(triphenylphosphine oxide) cerium(IV)

Another example is [Ce(NO$_3$)$_5$]$^{2-}$

Coordination Number 11

All-faced capped trigonal prism (D$_{3h}$)

This is not a common stereochemistry.

In aqua-(12-crown-4)-tris(nitrato-O,O')-cerium(III) (12-crown-4) solvate and (15-crown-5)-tris(nitrato-O,O')-cerium(III) the Cerium ion is 11 coordinate.

Coordination Number 12

cuboctahedron (Oh)

Ceric ammonium nitrate -(NH$_4$)$_2$Ce(NO$_3$)$_6$

Contributors and Attributions

- Prof. Robert J. Lancashire (The Department of Chemistry, University of the West Indies)