Electron configuration
- order of electron addition (Hund's rule, Aufbau, Pauli)
- order of electron removal (shilding & penetration)

Physical properties of transition metals
- change in radius across period
- lanthanide contraction

Complexes
- determining # of d^ - in a complex

K[Pt(NH₃)₆]Cl₂ → Pt^4⁺ 1
Platinum must be +4 to make the complex -1.

Potassium amminepentachloroplatinate(IV)

1) Complexes are named cation first then anion
2) Ligands are named in alphabetical order
3) Numerical prefixes are used with ligands, but the prefixes are not considered for alphabetization
4) If the complex is anionic, the ending "-ate" is used with the transition metal
5) The oxidation state of the TM is always written

Pt^4⁺: [Xe]5d⁶  Pt: [Xe]6s²5d⁸

*Exceptions to standard filling order: Cu, Cr

Cu: [Ar]4s²3d⁹ (according to rules)

Cr: [Ar]4s²3d⁴

Coordination number - the # of attachment points
to a TM
CN 6 → 6 monodentate ligands
2 tridentate
1 hexadentate (EDTA)
Isomers

3 bidentate ligands -> coordination #6

Geometries -
   octahedral, tetrahedral, square planar
   square planar - Ni, Pt

Isomers - same molecular formula, different structures

Structural isomers - different connectivity
   linkage isomer
   coordination isomer

Stereo isomers - different 90° arrangement
   geometric cis/trans
   optical left/right

Different ligands

[Pt(CN\textsubscript{3})\textsubscript{4}Cl\textsubscript{2}]\textsubscript{2}\textsuperscript{2-}
[Pt(NH\textsubscript{3})\textsubscript{2}(NO\textsubscript{2})\textsubscript{2}]Cl\textsubscript{2}

Counter ions

Nitro

Nitrito

Ligands - mono-, bi-, polydentate
must know name + structure of (en)\textsubscript{2}H\textsubscript{3}PDTA

Trans's mirror

Since the mirror image is identical to the original molecule, it does not have optical isomers

Cis's mirror

Since the mirror images are not identical, they are optical isomers,
hybridization not on exam

Octahedral splitting

\[ \text{Co}^{3+} \quad (\text{Co(H}_2\text{O})_6)^{3+} \]

\[ d_{x^2}, d_{y^2}, d_{z^2}, d_{xz}, d_{yz}, d_{xy} \]

Octahedral

Strong vs weak field ligands

\[ \uparrow \Delta \quad \downarrow \Delta \]

Strong field

large \( \Delta E \)

High frequency light

Weak field

lower \( \Delta E \)

Low frequency light

Tetrahedral

Square planar complexes experience different splitting because the geometries are different.

Bonus

\[ \text{Co} (\text{H}_2\text{O})_6^{3+} \]

Weak field

\[ \text{Co} : [\text{Ar}] 4s^2 \ 3d^7 \]

\[ \text{g}^+ : [\text{Ar}] 3d^6 \]

Paramagnetic—when some electrons are unpaired, the atom will respond to magnetic fields.

\[ \text{Co} (\text{CN})_6^{-3} \]

Strong field

\[ \text{pairing costs more energy than jumping up a level} \]

\[ \uparrow \Delta \quad \text{pairing costs less energy than jumping up a level} \]

diamagnetic—when all electrons are paired within orbitals, the atom does not interact with magnetic fields,