

CH-222

**Coordination chemistry**

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Cursus	Sem.	Type
Chemistry and chemical engineering	BA4	Obl.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Courses	3 weekly
<b>Number of positions</b>	

**Summary**

Fundamental knowledge of coordination compounds. Molecular symmetry and basic group theory.

**Content**

Chapters 1-2, 4-5 are given in English. Chapter 3 is given in English.

- 1. Coordination complexes:** concepts, nomenclature, structure and isomers
- 2. The preparation and stability of complexes:** Ligand substitution, thermodynamic stability, hard-soft acid-base theory, structural aspects of stability
- 3. Molecular symmetry and group theory:** operations and elements, point groups, matrix representations of groups, applications
- 4. Bonding in coordination compounds:** atomic orbitals (reminder), crystal field theory, ligand field theory, molecular orbitals
- 5. Properties of coordination compounds:** optical properties, explanation of electronic spectra, magnetic properties, magnetic measurements

**Learning Outcomes**

By the end of the course, the student must be able to:

- Recall typical ligands; name typical coordination compounds and describe their geometry. Judge the existence of isomers and draw such isomers; Calculate the oxidation states of metals and the number of d electrons.
- Apply soft-hard acid-base theory to predict the stability of complexes; interpret chelate effect; determine the relative stability of complexes according to structural factors.
- Deduce the crystal field splitting diagram for octahedral, tetrahedral, and square planar complexes; decide the electronic configuration. Generate the ligand field diagram for octahedral complexes.
- Decide if a complex is high spin or low spin using ligand field theory; understand and explain the spectrochemical series.
- Estimate the spin-only magnetic moment of complexes according to ligand field theory; Determine whether an electronic transition is allowed and the intensity of such transition.

**Assessment methods**

2 compulsory tests during the semester.

Final grade: 15% for each test + 70% for written exam

**Resources****Ressources en bibliothèque**

- [Inorganic Chemistry / Miessler](#)

- [Chemical Applications of Group Theory / Cotton](#)
- [Chimie et théorie des groupes / Walton](#)

**Websites**

- [http://scgc.epfl.ch/telechargement\\_cours\\_chimie](http://scgc.epfl.ch/telechargement_cours_chimie)

**Moodle Link**

- <http://moodle.epfl.ch/enrol/index.php?id=9461>