SAMPLE COURSE OUTLINE

Course Code, Number, and Title:

CHEM 2208: Coordination Chemistry

Course Format:
[Course format may vary by instructor. The typical course format would be:]

Lecture 4 h + Seminar 0 h + Lab 3 h

Credits: 3 **Transfer credit:** For information, visit bctransferguide.ca

Course Description, Prerequisites, Corequisites:

Fundamental concepts and principles governing bonding and reactivity of coordination complexes: ligand field theory, symmetry, and point groups; frontier molecular orbital theory.

Students will receive credit for only one of CHEM 2208 and 2224.

Prerequisites: CHEM 1120 and 1220.

Learning Outcomes:
Upon successful completion of this course, students will be able to:

- Describe the fundamentals of the chemistry of metal ions in aqueous solution by reference to Lewis acidity and basicity
- Correlate coordination number with molecular geometry, and recognize the factors that govern it
- Identify and distinguish between different types isomers in coordination complexes
- Determine the electronic structure of square planar, tetrahedral, and octahedral metal complexes by applying crystal field theory
- Understand the importance and relevance of symmetry to chemistry
- Determine molecular point groups by analyzing symmetry elements and operations
- Using character tables, generate molecular orbital energy level diagrams for simple molecules by determining the symmetry character of ligand group orbitals
- Generate molecular orbital energy level diagrams for octahedral metal complexes in the absence of pibonding, and in the presence of both pidonating and pi-accepting ligands
- Explain in broad strokes the spectrochemical series by showing the overlap of ligand-based pi-orbitals with appropriate metal-based orbitals
- Explain how colour arises in coordination complexes and describe the anticipated differences in colour between octahedral and tetrahedral complexes. Describe the different kinds of electronic selection rules and how they may be broken
- Develop and demonstrate "chemical intuition" by using first principles to predict the behaviour of coordination complexes

- Describe the action of haemoglobin and cytochromes with reference to electron transfer processes

Instructor(s): TBA
Office: TBA **Phone: 604 323 XXXX** **Email: TBA**

Office Hours: TBA

Textbook and Course Materials:
[Textbook selection may vary by instructor. An example of texts and course materials for this course might be:}

Housecraft, Catherine E & Sharpe, Alan G. “Inorganic Chemistry”. Pearson. 2015. Chapters 1, 2, 3, 4, 5, 7, 8, 19, 20, 24, 29

Note: *This course may use an electronic (online) instructional resource that is located outside of Canada for mandatory graded class work. You may be required to enter personal information, such as your name and email address, to log in to this resource. This means that your personal information could be stored on servers located outside of Canada and may be accessed by U.S. authorities, subject to federal laws. Where possible, you may log in with an email pseudonym as long as you provide the pseudonym to me so I can identify you when reviewing your class work.*

Assessments and Weighting:
Final Exam %
Other Assessments %
(An example of other assessments might be:) %

Midterm Exam: 30%
Quizzes/Tests: 15%
Assignments: 5%
Lab work: 20%

Grading System: Letter grade
Specific grading schemes will be detailed in each course section outline.

Passing grade: D

Topics Covered:
[Topics covered may vary by instructor. An example of topics covered might be:]

1) Coordination Chemistry

- Werner complexes, Lewis acids and bases, mono- and polydentate ligands, formation constants, and the chelate effect
- Basic shapes, isomerism, and nomenclature
- Crystal field theory for tetrahedral, octahedral, and square planar complexes

- Ligand field stabilization energy

(2) Symmetry
- Importance of symmetry
- Symmetry elements and operations
- Point groups and character tables

(3) Orbitals and Bonding
- Review of bonding models: Lewis, VSEPR, and VBT
- Review of atomic orbitals and molecular orbital treatments of diatomic molecules
- MO treatments of small polyatomic molecules, e.g., BH3
- MO treatment of octahedral complexes
- The spectrochemical series and "Hard-Soft Acid-Base" theory
- Pi-backbonding in metal-CO and metal-olefin complexes
- Optical and magnetic properties; UV-visible absorption spectra and selection rules.

(4) Chemical Reactivity
- Inert vs. labile complexes
- Dissociation, association, and interchange reactions; intermediates, transition states, and activation energies
- Ligand substitution reactions at square planar and octahedral metal sites, and the trans effect

(5) Organic and Biological Chemistry of Metals
- Amino acid ligands
- Haemoglobin
- Cytochromes

As a student at Langara, you are responsible for familiarizing yourself and complying with the following policies:

College Policies:

E1003 - Student Code of Conduct
F1004 - Code of Academic Conduct
E2008 - Academic Standing - Academic Probation and Academic Suspension
E2006 - Appeal of Final Grade
F1002 - Concerns about Instruction
E2011 - Withdrawal from Courses

Departmental/Course Policies:

This generic outline is for planning purposes only.

This generic outline is for planning purposes only.