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SC/CHEM 3030 3.0 Transition Metal Chemistry

Term Fall 2019

Location and Time

Lectures	MWF 12:30PM – 1:20PM (LAS C)
Tutorials	MW 8:30AM – 9:20AM (LSB 103)

specific tutorials dates will be announced in class

Prerequisites

SC/CHEM 2030	Basic Inorganic Chemistry
SC/CHEM 2020	Introductory Organic Chemistry I
SC/CHEM 2021	Introductory Organic Chemistry II

Course Director and Instructor

Prof. Christopher Caputo
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Phone: ext. 22964
Office: CB 354
Office Hour: F 1:30-2:30

Course Description

This course is a continuation and builds upon concepts learned in previous level inorganic and organic courses (SC/CHEM 2020, 2021, 2030). The chemistry of the transition metals is discussed from an historical perspective through modern theories on bonding, spectroscopy and organometallic complexes. This course will cover a broad spectrum of topics from symmetry and molecular orbital theory, to understanding coordination chemistry of transition metals and the importance of inorganic chemistry in biological processes (bioinorganic chemistry).

Purpose and Objectives of this Course

The purpose of the course is to further expand the knowledge gained in general chemistry and in previous introductory organic and inorganic chemistry courses. The course focuses on the chemistry of the d-block transition metals.

The following topics will be covered over the semester:

- Molecular Symmetry
- Bonding in Diatomic and Polyatomic Molecules
- Coordination Chemistry of the d-block
- Molecular Orbital Thoery in Transition Metals
- Spectroscopic Techniques for Transition Metal Complexes
- Metal-Ligand Self Assembly
- Bioinorganic Chemistry

At the end of the course, the students should be able to:
1) Communicate effectively with chemists in the field using proper nomenclature
2) Assign point groups and derive the irreducible representation of transition metal complexes
3) Derive the ground-state electronic configuration (using microstates and term symbols) for any transition metal with one or more d-electrons, and predict/explain the UV-VIS absorption spectra

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4) Use crystal field theory and molecular orbital theory to derive energy diagrams for transition metal complexes
5) Understand how complex 1-D, 2-D and 3-D materials can self-assemble from simple ligands and metal-ions
6) Describe how bioinorganic chemistry impacts life

Organization of the Course

Several pedagogical approaches will be used to deliver the course and achieve the objectives. The lectures will be delivered via a combination of written notes and PowerPoint support slides. Active participation of the students is required in various ways, including in-class problem solving, brain-storming sessions and discussion. Additional information about topics will be discussed in-class but will not be on the PowerPoint slides.
Sample problems will be assigned and discussed at the tutorials but will not be graded as part of the course.

Evaluation

The final grade for the course will be based on the following items weighted as indicated.

Class Participation	10%
Midterm Exam 1 (50 minutes)	25%
Midterm Exam 2 (50 minutes)	25%
Final Exam (3 hours)	40%

No make-up midterm will be available. The corresponding value of the midterm exam will be added to the final exam.

Important Dates

Classes Start – September 4, 2019
Last date to enrol in CHEM 3030 without permission – September 17, 2019 (no permission will be granted to enrol past this date)
Midterm Exam 1 (Tentative) – October 4, 2019
Fall Reading Week (No Classes) – October 12 – 18, 2019
Midterm Exam 2 (Tentative) – November 6, 2019
Last date to drop without receiving a grade – November 8, 2019
Classes End – December 3, 2019
Last Date to Submit Fall Term Work – December 4, 2019
Fall Examinations – December 5 – 20, 2019 (Exact final date TBD)

Textbooks

Much of the course will be based on the following books and are strongly recommended:

Housecroft, C.E.; Sharpe, A.G. *Inorganic Chemistry.* 4th Edition (2012) Wiley-Interscience Publication

Miessler, G.L.; Fischer, P.J.; Tarr, D.A. *Inorganic Chemistry* 5th Edition (2014) Pearson.

(Both books have been put on reserve at the Steacie Library)

Supplementary Activities

Students are **strongly** encouraged to attend all organometallic/inorganic presentations given by internal and invited speakers. Notice is posted throughout the Chemistry Building but usually take place on Thursday at 1pm in PSE317. I will bring such seminars to the attention of the class.

Email Communications

Email messages must have CHEM3030 as a subject line. Most course related questions and issues will however be addressed during class. Any administrative questions and issues should be directed to the Undergraduate and Graduate Program Assistants in the Chemistry Building (CB124).

Grading Scheme, Assignment Submissions, Lateness Penalties, Academic Integrity

The grading scheme for the course conforms to the point system used in other undergraduate programs at York. The final grade for the course will be calculated using the grading scheme listed above under "Evaluation".
In addition, students are expected to abide by rules set forth by York University. Any cases of academic misconduct or dishonesty will be treated accordingly. Ignorance of the Policies is not an acceptable excuse and students are strongly encouraged to become familiar with such Policies. The link to the Academic Integrity for Students website is www.yorku.ca/academicintegrity/students/index.htm. Students MUST also complete the Academic Integrity Tutorial, if they haven't already done so (www.yorku.ca/tutorial/academicintegrity/)
Furthermore, students are expected to familiarize themselves with the following information, available on the Senate Committee on Academic Standards, Curriculum & Pedagogy webpage (see Reports, Initiatives, Documents) – http://secretariat-policies.info.yorku.ca

- Senate Policy on Academic Honesty and the Academic Integrity Website
- Ethics Review Process for research involving human participants
- Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities
- Student Conduct Standards
- Religious Observance Accommodation