

**University of Puerto Rico Río
Piedras Campus
Faculty of Natural Science
Chemistry Department
Graduate Program**

Title: Advanced Inorganic Chemistry I: From Atoms to Coordination Compounds

Course: Chemistry 6011

Credits: 3

Hours: Tuesday/Thursday, 10:30-11:50 am, FB 266

Professor: Arthur Tinoco, FB-312, Arthur.david.tinoco@gmail.com

Office Hours: 1:00-3:00 pm, Tuesday & Thursday

Website: <http://uprrpadvancedinorganicchemistry.weebly.com/>

Facebook page: <https://www.facebook.com/groups/1203910352992811/>

Course Description: Students will revisit the fundamentals of atomic and molecular orbitals and will survey the theories used to explain how atoms and molecules bond. Group theory will be used to deepen the understanding of bonding from the perspective of symmetry and to predict molecular spectroscopic properties. The course will then discuss several facets of coordination chemistry such as nomenclature, isometry, bonding theories, spectroscopy, and introduce organometallic chemistry.

Objectives: Defined in the table below specifying the time dedicated to each topic and the dates on which the topics will be covered.

Date	Topic	Assignment Due
Aug. 9	Reading Period	
Aug. 11	Reading Period	
Aug. 16	Course Introduction Chapter 2 (Starting from page 26): The concept of the orbital and symmetry	
Aug. 18	Huheey Chapter 18: Periodicity	
Aug. 23	Periodicity Lecture 2	
Aug. 25	Chapter 4: Introduction to molecular symmetry and Group Theory	
Aug. 30	Chapter 4: Point Groups and Character Tables	
Sept. 1	Chapter 4: Bonding Theories-Lewis Structures and VSEPR	
Sept. 6	Chapter 3: Simple Bonding Theories	
Sept. 8	Huheey's Valence Bond Theory	

Sept. 13	Chapter 5: Molecular Orbital Theory for Diatomic Molecules	
Sept. 15	Chapter 5: Molecular Orbital Theory and Polyatomic Molecules	HW Set 1: Ch. 2, 3, 4, and Huheey Material
Sept. 16	Exam 1 (Ch. 2, 3, 4, and Huheey Material)	
Sept. 20	Chapter 5: Molecular Orbital Theory and Polyatomic Molecules Continuation	
Sept. 22	No Class	
Sept. 27	Discussion on Project Assignment Introduction to Ionic Compounds (Ch. 5.3.2) Chapter 7: Crystalline Solid State	
Sept. 29	Chapter 7: Conductivity	
Oct. 4	Chapter 7: Inter/intramolecular Forces	
Oct. 6	Chapter 6: Acid-Base Chemistry A	
Oct. 11	Chapter 6: Acid-Base Chemistry B	
Oct. 13	Chapter 6: Oxidation and Reduction Chapter 9: Introduction to Coordination Chemistry- Werner's Complexes	HW Set 2: Ch. 5, 6, 7
Oct. 14	Exam 2 (Ch. 5, 6, 7)	
Oct. 18	Chapter 9: Nomenclature, Isomerism, Structures	
Oct. 20	Chapter 10: Coordination Chemistry Bonding and Aqueous Speciation (Thermodynamics)	
Oct. 25	Chapter 10: Bonding theories to explain Coordination Compounds A	
Oct. 27	Chapter 10: Bonding theories to explain Coordination Compounds B	
Nov. 1	Chapter 10: Bonding theories to explain Coordination Compounds C	
Nov. 3	Chapter 11: Understanding the Absorption Electronic Spectra of Coordination Compounds A	Paper Submission
Nov. 10	Chapter 11: Understanding the Absorption Electronic Spectra of Coordination Compounds B	HW Set 3: Ch. 9,10
Nov. 15	Crabtree Chapter 1 and 2: Introduction to Organometallic Chemistry A	
Nov. 16	Exam 3 (Ch. 6 redox, Ch. 9, Ch. 10)	
Nov. 17	Crabtree Chapter 1 and 2: Introduction to Organometallic Chemistry B	
Nov. 22	Presentations	

Nov. 24	Thanksgiving Recess	
Nov. 29	Presentations	HW Set 4 (Ch. 11 and Crabtree Material)
Dec. 1	Presentations	
Dec. 2	Exam 4 (Ch. 11, Crabtree Material, Material from Presentations)	

Textbook: Inorganic Chemistry Fifth Edition By: Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr

Supplementary Material

Instruction Techniques: This course is designed with an emphasis on a student-teacher interactive pedagogy. Lectures consist of a combination of hand-written notes (predominantly) and PowerPoints. Students are expected to ask questions and to engage in discussions in class and via the Facebook course page. The most current information for the course can be obtained from the class website. You will find there a copy of this syllabus, announcements, homework keys, exam keys, class powerpoint slides, and supplemental information. Please check this site frequently. Feel free to contact me at arthur.david.tinoco@gmail.com if you have a general question then post it to the class Facebook page.

Requirements:

1. Calculator- For all homework assignments and exams.
2. Laptops- To access journal articles to complete homework assignments and the final writing/presentation assignment.

Grading System

Homework. Homework assignments will be posted on the website and due dates are posted on this syllabus. You will also receive short assignments throughout the semester. 10%.

Participation. Attendance is a requirement in this course. For full credit, it is expected that you engage in course discussion in class and via the Facebook page. 5%

Paper/Presentation Assignment. You will prepare both a manuscript and presentation on Main Group chemistry. Complete instructions for this assignment will be provided during the semester. 25% Total

Exams. Four exams will be given in class on the dates listed. 60%

Grading Summary. Listed below is the overall breakdown of the grading scheme for the course. I will use the numerical score obtained using this scheme to guide me in assigning your final grade. Your exact final grade will be assigned based on my evaluation of your understanding of the subject material. I will be most happy to discuss your standing in the class at any time.

Homework: 10%

Participation: 5%

Paper: 15%

Presentation: 10%

Exams (4): 60%

Academic Honesty. I strongly believe in the integrity of an academic honor code. This is a code of honesty that all work submitted is produced solely by the student who is submitting. All students will be expected to abide by this academic honor code. Any examples of violation of the academic code will result in the total loss of credit on a given assignment and may be subjected to disciplinary actions by the Junta de

Disciplina. Violations of this code include, but are not limited to, plagiarism of homework and written assignments, copying exams, and fabricating exam answers after an exam has been corrected and returned.

Make-up Policy. Notify me as soon as possible if you are unable to take an exam because of illness or other extraordinary circumstances.

Note. Students who receive **Vocational Rehabilitation** services need to communicate with the professor at the start of the semester so that a plan can be devised to provide reasonable accommodation and assistive equipment in accordance with the recommendations of the “Oficina de Asuntos para Personas con Impedimento (OAPI) del Decanato de Estudiantes.”

Supplementary Material. For additional information please refer to any research articles cited during lectures. Also the following textbooks are very helpful.

James E. Huheey, Ellen A. Keiter, and Richard L. Keiter. *Inorganic Chemistry*. 4th Edition.

Robert H. Crabtree. *The Organometallic Chemistry of the Transition Metals*. 6th Edition.

Catherine E. Housecroft and Alan G. Sharpe. *Inorganic Chemistry*. 4th Edition.

F. Albert Cotton, Geoffrey Wilkinson, Carlos A. Murillo, and Manfred Bochmann. *Advanced Inorganic Chemistry*. 6th Edition.

Online resource: <https://www.ionicviper.org>