

# Chemistry 307

## *Inorganic Chemistry*

Spring 2017

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Lecture: M, W and F 12:35 p.m. - 1:25 p.m.; Discussion: W, 1:40 p.m. – 2:30 pm; CU 109

Office Hours: M and F, 1:40 p.m. – 2:30 a.m., FH 125; other times by appointment.

### Required Textbook:

Inorganic Chemistry, 6th Edition, D. Shriver, M. Weller, T. Overton, J. Rourke and F. Armstrong, ISBN-13: 978-1-4292-9906-0, W.H. Freeman, 2014

Free abbreviated solutions to exercises can be found at:

[http://bcs.whfreeman.com/ichem6e/default.asp#897912\\_935414](http://bcs.whfreeman.com/ichem6e/default.asp#897912_935414)

### Recommended Materials:

#### 1) Solutions Manual

Detailed solutions to problems provided in “Solutions Manual to Accompany Inorganic Chemistry, 6<sup>th</sup> Edition, A.Hadzovic, ISBN-13: 978-1-4641-2438-9, W.H. Freeman, 2014”.

2) Molecular Model Kit, ISBN-09648837-0-8 (2001), by Stephen Darling (see [www.molecularvisions.com](http://www.molecularvisions.com) or [www.darlingmodels.com](http://www.darlingmodels.com)). Model kits for organic chemistry classes do not contain pieces for constructing octahedral and trigonal bipyramidal shapes, which are common in inorganic chemistry. For visualizing symmetry elements and assignment of point groups, some students prefer the website <http://symmetry.otterbein.edu/tutorial/pointgroups.html> to a Molecular Model Kit.

Learning Outcomes: Master basic concepts in inorganic chemistry, such as structure and bonding, transition metal chemistry and organometallics, as well as obtain an appreciation for the role of metal ions in biological systems.

Course/Instructor Evaluation (IDEA): Loyola has adopted IDEA for instructor and course evaluations. After the withdrawal deadline (Monday, March 28th) and up to the last day of final classes, students will be given the opportunity to evaluate both the instructor and the course by using an online survey. The essential IDEA objective for this course is building a sizeable knowledge base of inorganic compounds, and the important IDEA objectives are: 1) learning the

fundamental principles and theories that relate to inorganic compounds; and 2) learning to apply what you know from the course to solving problems.

By the end of the first week of classes, students who need special testing accommodations should give the instructor documentation that has been approved by the Services for Students with Disabilities (SSWD).

CHEM 307 is an advanced upper-level class and, for Private Tutoring, you may wish to seek the help of a senior who has successfully completed the course or of a graduate student who is conducting research in the area of inorganic chemistry.

Sakai and Lecture Notes: The Instructor will upload lecture notes and slides on Sakai, and will make every effort to have the materials posted on the site at least a day before the lecture. A word of foreknowledge is that the PowerPoint presentations can be quite large (on the order of megabytes) and hence, if you do not have a high-speed internet connection at home, you should consider using Loyola's computer resources to download the materials.

Grading Policy: 100 points for each of the two 50-min exams, 25 points for each of the four 15-min quizzes, and 200 points for the final exam for a grand total of 500 points. The exams will be made up of multiple-choice and short-answer questions, but for the quizzes only multiple-choice questions. The final exam will be comprehensive with 60% covering material since Exam II and the remaining 40% on the material from Exams I and II. No makeup exams or quizzes will be given. For missed exams, a **written** doctor's or judge's excuse, or a letter from a funeral director, or documentation supporting an officially-approved activity or a Medical School interview is required. The score of a missed exam or quiz will be assigned based on the average of the other exams or quizzes.

Class grades will be calculated by two separate methods. The method that generates the highest letter grade will be used.

*Method 1*: The mean of the total raw scores for the class will be calculated and designated as the C+/B- cutoff. One-third of the standard deviation will be added or subtracted from the mean to arrive at the remaining grades. For example, a student must be one standard deviation above the mean to obtain a grade of A-.

*Method 2*: Total raw scores will also be used to establish final letter grades:

A = 100-85; A<sup>-</sup> = 84-80; B<sup>+</sup> = 79-75; B = 74-70; B<sup>-</sup> = 69-65; C<sup>+</sup> = 64-60; C = 59-55;

C<sup>-</sup> = 54-50; D<sup>+</sup> = 49-45; D = 44-40; F = Less than 40

Lecture #	Date	Topic	Reading
1	1/18	Atomic Structure	Ch. 1
2	1/20	Shielding	Ch. 1
3	1/23	Atomic Properties	Ch. 1
4	1/25	Molecular shapes and VSEPR	Ch. 2.1 - 2.3
5	1/27	Symmetry Elements	Ch. 6.1
6	1/30	Point Groups	Ch. 6.1
7	02/1	Polarity and Chirality	Ch. 6.3, 6.4
8	02/3	VB Theory of Diatomics and Polyatomics	Ch. 2.4 – 2.6
9	02/6	MO Theory of Homo- and Hetero-Diatomics	Ch. 2.7 – 2.9
10	02/8	MO Theory of Polyatomics	See Power Points
11	2/10	Review	
12	2/13	EXAM I (Lectures 1 – 10)	
13	2/15	Acids and Bases	See Power Points
14	2/17	Nomenclature of Coordination Compounds	Ch. 7.1, 7.2
15	2/20	Coordination numbers	Ch. 7.3 – 7.6
16	2/22	Isomerism of Coordination Cpds.	Ch. 7.7 – 7.10
17	2/24	Crystal Field Theory	Ch. 20.1
18	2/27	Crystal Field Theory	Ch. 20.1
19	03/1	Magnetochemistry	Ch. 20.1, 20.8
20	03/3	Crystal Field Theory	Ch. 20.1
21	3/13	Ligand Field Theory	Ch. 20.2
22	3/15	Review	
23	3/17	EXAM II (Lectures 13 – 21)	

Lecture #	Date	Topic	Reading
24	3/20	Term Symbols	Ch. 20.3
25	3/22	Electronic Spectra	Ch. 20.4–20.6
26	3/24	Electronic Spectra	Ch. 20.4–20.6
27	3/27	Electronic Spectra	Ch. 20.4-20.6
28	3/29	Substitution Reactions in $O_h$ Complexes	Ch. 21.1,21.2,21.6,21.7
29	3/31	Substitution Reactions in $D_{4h}$ Complexes	Ch. 21.3, 21.4
30	04/3	Electron Transfer Reactions	Ch. 21.10 – 21.12
31	04/5	Bioinorganic Chemistry	Ch. 26
32	04/7	Bioinorganic Chemistry	Ch. 26
33	4/10	Bioinorganic Chemistry	Ch. 26
34	4/12	Metals in Medicine	Ch. 27
35	4/19	Metals in Medicine	Ch. 27
36	4/21	18- $e^-$ rule and nomenclature of organometallic cpds	Ch. 22.1-22.4
37	4/24	Carbonyl and $\pi$ -donor complexes	Ch. 22.5-2.15,22.17,22.18g
38	4/26	Organometallic Rxns&Catalysis	Ch.22.21-22.26,25.1-2,25.4,25.18
39	4/28	Review	

The final examination will be on Fri, 5/5, 9:00 a.m. - 11:00 a.m., Cuneo 109 (60% on Lectures 24-38; 20% on Lectures 1-10, and 20% on Lectures 13-21).

Academic Integrity: Refer to the policies on dishonest academic behavior in the Undergraduate Studies Catalogs <http://www.luc.edu/media/lucedu/cas/pdfs/academicintegrity.pdf> Students are advised to download and read the statement as it will be part of the governance of their efforts in the course. In addition, as pre-professional students at Loyola University Chicago, it should be obvious at this stage of your careers that all answers on examinations must arise from independent, honest efforts. Nothing less is acceptable in the Land of Lincoln. Thus, any student found cheating on any examination will receive an automatic "0" for that examination. Moreover, depending on the severity of the misconduct, a final grade of F may be assessed for the course. His (her) name will be reported to Dr. Mota de Freitas, the Chairperson of the Department of Chemistry and Biochemistry, as well as to the Dean of the College of Arts and

Sciences, who will decide whether further disciplinary action is necessary. We remind you that such an incident will become part of one's personal record and may be transmitted to organizations such as medical or dental schools, pharmacy and graduate programs, etc.

Appropriate In-class Behavior and Electronic Devices: It is incumbent upon you, as a student, to maintain a professionalism and code of conduct appropriate with the course material and course enrollment. To this end, rude, disruptive behavior (such as talking during class, viewing computer materials not concerning class subjects, etc...) will not be tolerated. It is acceptable to use laptops or comparable devices (tablets, iPads, etc.) for taking notes in class. Voice recording but not visual recording is allowed. Cell phones, pagers, etc. must be turned off during class. If your device is activated during class, you must leave the class immediately and cannot return for the duration of that class period.

Error Policy: The instructor reserves the right to amend or correct this syllabus.