

**351 Inorganic Chemistry 1
1st half , Chemical Bonding****Syllabus**

Times & Locations: Monday & Wednesday 1:00 pm – 2:20 pm;

Lectures : HILL 116

Instructor: Charles Dismukes (office: WR 113)

Contact: dismukes@rutgers.edu

Instructor Office Hour: TBD first class. (Mondays & Wednesday 1:20-1:50 pm)

Course Credits: 3.0 (14 weeks)

Course Duration: Sept 1, 2021 to October 18, 2021 (7 weeks)

Course Overview:

The course primarily covers quantitative aspects of atomic theory and bonding in molecules and solids (metallic, covalent and ionic bonding), group theoretical representations of molecules, molecular orbital theory of inorganic molecules. This course is intended for students majoring or minoring in Chemistry and is a pre-requisite for Inorganic Chemistry, 01:160:371.

Course prerequisites:

01:160:305, 307, or 315 Organic Chemistry with lab. Specifically, knowledge of molecular structures, symmetry, valence bonding (Lewis structures), elementary molecular orbitals,

01:[640:152 Calculus II for the Mathematical and Physical Sciences](#) or equivalent. Specifically, differential and integral calculus, parametric curves, polar coordinates, and complex numbers.

Instructional Format and Philosophy:

Assigned Readings: Textbook, lecture notes and in class assignments.

Lecture Notes: posted in advance (asynchronous); students expected to read and prepare material in advance.

In Class Lecture and Assignments: students should be prepared to contribute to the course discussion by answering assignments in class; prepare these in advance and contribute orally in class.

Homework Assignments (6): high pass/pass/fail (ungraded) homework upload before lecture for points. All homework should be prepared by each individual student; submission of homework done by others is a violation of the honor code.

Quizzes and Exams: live only, given in the class period, bring your laptops to access online in class. IP addresses outside of class will not be allowed to access assessments.

Extra Study Guides: embedded links in lecture notes to other resources offer extra help. No points.

Virtual Office Hour by the Instructor: live, fixed times: **Tentatively, Mondays & Wednesday 1:20-1:50 pm**

Voluntary Study Groups will be run by a Teaching Intern (Robert Abrahams); Groups meet **at fixed time to be determined; Two periods: 1 h recitation +1 h by appt.** TI assists with learning of textbook readings, lecture material and homework strategy.

Assigned Readings from Textbook:

Inorganic Chemistry, 7th Edition (Weller, Overton, Rourke, Armstrong). Oxford Univ. Press (UK). 6th Edition may be used for Ch 1-8 as these are unchanged according to the authors Forward Statement.

Lectures Notes, in Class Assignments and Extra Study Guides

Content will consist of:

-pre-lecture slides posted at least 24 hr in advance of lecture.

-post-lecture updated slides and/or notes with written comments made during class (if any).

Students should take written notes during class of any material the instructor covers on the board. *Lectures and class slides are not exhaustive* and students should use them *in conjunction* with the pre-assigned textbook readings, notes/examples taken during lectures and assigned homework problems to learn the course topics. Assigned readings from the textbook are associated with each lecture and are listed in the table below. Students should read the assigned section of the textbook *before* the associated lecture. **The**

lecture slides, notes and study guides are copyrighted and may not be posted on any website at or outside of Rutgers without the written permission of the course instructor. Noncompliance with this policy will be treated as a violation of the Code of Student Conduct and will be referred to the Office of Student Conduct for action.

Assigned Homework Problems:

The assigned homework problems will be taken mostly from the textbook and will be posted on Canvas. The purpose of the assigned homework problems is to guide students to learn and retain the key concepts. They also serve to prepare students for the exams, which will contain questions similar to those in the assigned homework problems. There will be six assigned homework problems. The homework assignments are due at the beginning of class on the dates specified in the assignments (see table below). Late assignments lose 50% if handed in after the start of class and lose all points if handed in after the end of the class in which they are due.

Quizzes and Exams:

The schedule of quizzes, homework and exams, as well as the breakdown of the grading, are given below. Quizzes will take place at the beginning of the class, duration is 12 minutes, and will cover the previous two lectures. Two exams will be given: Exam 1 will cover Lectures 1-6 and the associated assigned textbook readings. Exam 2 will cover Lecture 7-12 and the associated textbook assigned readings. The examinations will cover the topics in the assigned textbook readings and lecture slides and notes, whether or not they are specifically covered in class. The working problems and the conceptual problems at the end of each chapter of the textbook will help you understand the chemical concepts covered in the course more effectively and will help you prepare for the quizzes and exams. *Therefore, it is strongly suggested that you do all the assigned homework problems and some additional problems at the end of the relevant chapter of the textbook.* Exams will last for the duration of the class period (i.e., 80 min.). No make up quizzes or exams will be allowed unless the absence is authenticated by means of legitimate, verifiable, documented excuses (e.g., signed doctors note, hospital admittance slip, but not from non-professional medical staff, etc.) Authentic excuses should be presented to the instructor at the end of a class or during the instructor's office hour. **The absence of verifiable documentation will not be accepted under any circumstances.**

New Academic Integrity Policy & Procedures: The university academic integrity rules apply to students taking this course; see <https://nbprovost.rutgers.edu/academic-integrity-students> Students are obligated to tell the instructor if violation of AI is observed. Communicating in any manner (texting etc.) during a quiz or exam will be treated as a violation of the honor code.

Grading: The grade for the course will be based on homework, quizzes and exams.

2 Quizzes 40 points (20 each)

Submitted high pass/pass/fail (ungraded) Homeworks (6), 60/30/0 points

Exam 1, 100 points

Exam 2, 100 points

Total, 300 points

Tentative Class Schedule & Assigned Textbook Readings (subject to change)

Class #	Day	Date	Topic	Homework & Exercises	Textbook Reading
1	W	9/1	<u>Lecture 1:</u> Course Overview; Hydrogen & Hydrogen like atoms	HW 1 assigned	1.1, 1.2, 1.3a, 1.6
2	W	9/8	<u>Lecture 2:</u> Wavefunctions; Atomic orbitals	In class Ex 1 HW 1 due	1.3-1.4
3	M	9/13	Quiz 1 <u>Lecture 3:</u> Many-electron atoms; Atomic properties	HW 2 assigned	1.5, 1.7
4	W	9/15	<u>Lecture 4:</u> Electronegativity; Bond properties; Lewis structures	In class Ex 2 HW 2 due	1.7, 2.13-2.16, 2.1-2.2

5	M	9/20	<u>Lecture 5</u> : Lewis structures; VSEPR	HW 3 assigned	2.1-2.3
6	W	9/22	<u>Lecture 6</u> : VB & MO theory of diatomics	In class Ex 3	2.4-2.7
7	M	9/27	Exam 1	HW 3 due	All Topics of Lectures 1-6
8	W	9/29	<u>Lecture 7</u> : MO theory of diatomics	HW 4 assigned In class Ex 4	2.7-2.10
9	M	10/4	<u>Lecture 8</u> : MO theory of polyatomics; Introduction to symmetry and group theory	In class Ex 5 HW 4 due	2.11, 3.1, 3.2
10	W	10/6	Quiz 2 <u>Lecture 9</u> : Construction of MOs; Symmetry applications to polyatomics	HW 5 assigned	3.6-3.11;
12	M	10/11	<u>Lecture 10</u> : Stereoisomers, Chirality	In class Ex 6	3.3-3.5, handout
13	W	10/13	<u>Lecture 11</u> : Solids; Metals and alloys	HW 5 due HW 6 assigned	4.1-4.8
14	M	10/18	<u>Lecture 12</u> : Ionic solids	In class Ex 7 HW 6 due	4.9-4.10
15	W	10/20	Exam 2		All Topics of Lectures 8-14

Chem 351 - Inorganic Chemistry, 2nd Half

Syllabus, Fall 2021

Instructor: Teddy (Tewodros) Asefa

Office: Room, CBE-138 (in Chemical Engineering or Engineering C-Wing Building)

E-mail: tasefa@chem.rutgers.edu

Office hours: Wednesdays 11:00 am - 12:00 pm or by appointment

Course Website and Lectures: Check on Canvas

Meeting Times: Mondays and Wednesdays, from 1:00 pm – 2:20 pm, beginning on October 25, 2021 and finishing on December 13, 2021.

Course Duration: October 25, 2021 to December 13, 2021 (7 weeks or 14 lecture/exam hours)

Class-Room: HILL 116 (In Hill Center on Busch Campus)

Credits: 1.5 (for the second half)

Undergraduate Office Administrator in Department of Chemistry and Chemical Biology: Ola Elshorafa, CCB 1108A (in the New Chemistry Building,

Chemistry Department); Tel.: 848-445-3223;

E-mail: ola.elshorafa@rutgers.edu or ohe6@chem.rutgers.edu

Any problem involving registration, scheduling, or other clerical issues are best handled by contacting Ola Elshorafa.

Course prerequisites: 01:160:305, 307, or 315 Organic Chemistry with lab. Specifically, knowledge of molecular structures, symmetry, valence bonding (Lewis structures), elementary molecular orbitals,

01:640:152 Calculus II for the Mathematical and Physical Sciences or equivalent. Specifically, differential and integral calculus, parametric curves, polar coordinates, and complex numbers.

Materials and Text-Books: Textbook: *Inorganic Chemistry, 7th Edition* (Weller, Overton, Rourke, Armstrong). Oxford Univ. Press (UK). 6th Edition may be used for Ch 1-8 as these are unchanged according to the authors Forward Statement.

Assignments and Lectures: The materials covered in lecture will be illustrative rather than exhaustive. *You should read the materials in the text assigned before the lecture.* The syllabus includes assigned reading from the text and associated problems for each lecture. You will benefit most from the lectures if you read the assigned material *before* the lecture. Working problems and the Conceptual Problems at the end of each chapter will help you understand the chemical concepts more effectively. The examinations will cover both the assigned text and lecture materials as well as related problems whether or not they are specifically covered in lecture or not. It is, therefore, strongly suggested that you do all the recommended problems and some additional ones too.

Office Hours: Professor Teddy Asefa will be available to answer questions and students' concerns during office hours.

Email: The professor and the TAs can only read and answer emails that have a Rutgers e-mail address. All others may sometimes get filtered out by the instructor's e-mail account without the instructor's knowledge for spam and possible computer virus problems.

Attendance/Quizz: Attendance in classes is expected. Unannounced attendance may be taken during lectures and/or pop-Quizzes may be given from time to time. These will be used as part of 10% of the overall grade of this part of the course (see below).

Grades and Examinations: There will be two, 1 h & 15 min-long exams. Students should arrive on time to take the exams. A student that arrives late (by 20 minutes or more) may not be allowed to take the exam, especially if any one student has completed his/her exam and has gone outside. No additional time will also be given to a student who may start the exam late because he/she arrives late.

There is absolutely No make-up exam no matter the circumstances are. If a student fails to take any of the exams for a valid *documented in writing medical/emergency reason*, the

average of the remaining exams will be converted to make up for the missed one to calculate the final grade. Because an e-mail sent is not always an e-mail received, advance notice for absences cannot ever be accepted by e-mail and you will need to get a confirmation from Prof Asefa. You are urged to obtain a simple scientific calculator that includes log, ln and exponential functions in addition to standard arithmetic functions.

Grading: The three 1 h & 15 min long exams will count for 100 % of the grade. The exams will be given at the same place where the classes are held.

Calculation of the Final Grade for the second half of the course is based on: *

Exams and Attendance/Quizzes	Percentage (%)
Exam 1	45
Exam 2	45
Attendance/Quizzes	10
Total	100

* **Note about Grades:** Only one grade for each student from the course will be given (for the 3 Credit) at the end of the semester. In other words, although the course is divided into two parts and taught by two different professors, there will only be one grade (not two grades) for the entire course at the end of the semester, which is determined based on the combination the students' results and the grading curve.

Academic Integrity: The usual rules apply (<http://ctaar.rutgers.edu/integrity/policy.html>).

Cheating, plagiarism and academic dishonesty: Cheating will not be tolerated. You may be required to show your Rutgers ID when you turn in your exam to compare your picture and signature. Students caught cheating will fail the assignment (gets 0 point on the specific assignment. University policy on academic dishonesty will be followed and the student(s) will be referred to the appropriate university office for disciplinary action. A letter will be sent explaining the punishment to the Associate Dean of Undergraduate Affairs. If you have further complaints regarding the failed assignment and the letter, you must contact the Associate Dean for Undergraduate Affairs directly.

Each student has to turn in his or her own exams. Copying is considered cheating and will be treated as stated above, with 0 points given for the exam and a letter to the Dean's offices. If you let someone copy your exam and quiz from you, you will have 50% deduction from your grade and a letter sent to the Associate Dean of Undergraduate Affairs and persons in charge in your college describing these.

Lecture Etiquette: Please silence all pagers and cell phones prior to the start of lecture. If you come in late and lecture has already begun, please take a seat at the end of a row (and preferably near the back of the lecture hall) as a courtesy to those already seated. Leave your crossword puzzles, newspapers, snacks, etc., at home or in your packs. You and your fellow students are here to learn. The class is 1 h and 20 min long — coming and going during class is disruptive.

Canvas: Students enrolled in the course will have access to course materials and notices through Canvas.

COVID-19 Related: In order to protect the health and well-being of all members of the University community, masks must be worn by all persons on campus when in the presence of others (within six feet) and in buildings in non-private enclosed settings (e.g., common workspaces, workstations, meeting rooms, classrooms, etc.). Masks must be worn during class meetings; any student not wearing a mask will be asked to leave. Masks should conform to CDC guidelines and should completely cover the nose and mouth: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-facecoverings.html>

When you come to campus to attend class, be sure to renew your Campus Pass on MyRutgers.

Miscellaneous: Excuses from class for non-COVID related medical reasons will normally only be given if such absences are advised by a health care provider or the Health Center based upon clinical findings and prescribed treatment recommendations. Verification must be made in writing. Such absences can be verified by the faculty member if needed.

However, students who have been told to quarantine, or are experiencing symptoms of any transmittable disease, to remain at home and not attend in-person class meetings. Documentation from students to excuse absences in such cases are only encouraged, and not necessary.

Approximate Course Calendar, Spring 2021 (Subject to slight change) *

Date	Topic	Text-Book	Exercises
Mon., Oct. 25	Lecture 1: Syllabus; Introduction; Review	Chapter 4	Any in the book related to the lecture discussions
Wed., Oct. 27	Lecture 2: Acids and Bases	Chapter 4	<i>The same as above</i>
Mon., Nov. 1	Lecture 3: Acids, Bases and Aqueous Chemistry	Chapter 4	<i>The same here</i>
Wed., Nov. 3	Lecture 4: Acids, Bases and Aqueous Chemistry	Chapter 4	<i>The same here</i>
Mon., Nov. 8	Lecture 5: Oxidation and Reduction	Chapter 5	<i>The same here</i>
Wed., Nov. 10	Lecture 6: Oxidation and Reduction	Chapter 5	<i>The same here</i>
Mon. Nov. 15	Exam 1	Related to Lectures 1-6	
Wed., Nov. 17	Lecture 7: Oxidation and Reduction	Chapter 5	<i>The same here</i>
Mon. Nov. 22	Lecture 8: Introduction to Symmetry	Chapter 6	<i>The same here</i>
Wed., Nov. 24	<i>No Class – Thanksgiving Recess</i>		
Mon. Nov. 29	Lecture 9: Introduction to Symmetry	Chapter 6	<i>The same here</i>
Wed. Dec. 1	Lecture 10: Introduction of Coordination Compounds	Chapter 7	<i>The same here</i>
Mon. Dec. 6	Lecture 11: Introduction of Coordination Compounds	Chapter 7	<i>The same here</i>
Wed. Dec. 8	Lecture 12: Physical Techniques in Inorganic Chemistry (Only selected topics for illustration and if time allows)	Chapter 8	<i>The same here</i>
Mon. Dec. 13	Exam 2	Related Lectures 7-12	

* Subject to change depending on the pace of covering some lectures that may need more explanations on demand during lecture hours in classes.