

CHEM441 – Inorganic Chemistry I

Fall Quarter 2021

MTRF 10–10:50, M107

Office Hours: T 1–1:50, R 1–2:50

other times by appointment

Stephanie Poland, Ph.D.

Office: M225-B; Research Lab: J304

Phone Extension: 8801

Email: poland@rose-hulman.edu

Required Materials

Miessler, G.L.; Fischer, P.J.; Tarr, D.A. *Inorganic Chemistry*, 5th ed.; Pearson Education, Inc.: Upper Saddle River, N.J.: 2014.

Other good reference books include the following:

Principles of Inorganic Chemistry by Pfennig

Inorganic Chemistry by Shriver and Atkins

Inorganic Chemistry by Huheey, Keiter, and Keiter

Chemistry of the Elements by Greenwood and Earnshaw

Chemical Applications of Group Theory by F. Albert Cotton

ACS Style Guide, Editors Anne M. Coghill & Lorrin R. Garson

You can stop by my office to check out any of these books on a night-by-night basis.

The syllabus, handouts, and other materials will be uploaded to the course's Moodle page:

<https://moodle.rose-hulman.edu/login/index.php>

Course Grading

Problem Sets, Participation	100 points
Three 50-minute Exams	300 points
Final Exam	100 points
TOTAL	500 points

Grade Cutoffs

90%	A	70%	C
86.7%	B+	66.7%	D+
80%	B	60%	D
76.7%	C+	< 60%	F

Tentative Exam Schedule

Exam I	Thursday, Week 3
Exam II	Monday, Week 7
Exam III	Monday, Week 10

These dates are still tentative. Should the exam schedule need adjusting, you will receive advanced notice (≥ 2 days).

Academic Accommodations

I understand that "invisible" disabilities (e.g., learning and attention deficit disorders, chronic fatigue syndrome, depression, anxiety, etc.) can significantly affect a student's academic performance. I strongly encourage students to document special academic circumstances with Student Accessibility Services (HMU 156, 812-877-8040, eaton1@rose-hulman.edu). Please then contact me as soon as possible so that we can work together to provide the recommended academic accommodations while protecting your privacy. Please note that it is your responsibility to request any approved, documented academic accommodations (such as extra time) at least three days in advance of exams.

Inorganic I – Course Objectives

CHEM441, Inorganic Chemistry I is a course designed to investigate the relevant chemistries behind the entire periodic table, with specific regard given to the Group A (main group, s- and p-block) elements. The following course in the sequence (CHEM442, Inorganic Chemistry II) discusses the properties and reactivity of the Group B (transition metal, d-block) elements and their compounds.

Specifically, CHEM441 has been designed to give you the tools you need in order to accomplish the following:

1. **Atomic and Electronic Structure:** Explain both the shape and the filling order of electronic orbitals as well as the full electronic structure of the atom. Determine the ground state (and other term symbols) for atoms and ions.
2. **Periodic Table:** Describe the overall design of the periodic table. Explain elemental relationships and trends including size and reactivity with specific regard for the Group A (main group) elements.
3. **Chemical Bonding:** Explain the nature of chemical bonding using multiple theories including Lewis Dot Structures, VSEPR, Hybridization, and Molecular Orbital Theory. Relevant similarities and differences between covalent, ionic, and metallic bonding will also be discussed.
4. **Molecular Symmetry and Vibrational Spectroscopy:** Identify symmetry elements present in three-dimensional chemical structures. Utilize Group Theory to explain and predict spectral patterns for various compounds.
5. **Solid State:** Describe chemical bonding in solid materials including crystalline lattices and ionic structures.
6. **Structure/Property Relationships:** Utilize knowledge of intermolecular forces to describe physical properties of chemicals. Explain and differentiate between the various acid/base theories including Arrhenius, Brønsted/Lowry, Lewis, and Hard/Soft Acid/Base (HSAB).

Academic and Professional Integrity

“Rose-Hulman expects its students to be responsible adults and to behave at all times with honor and integrity. All students are expected to abide by this Code and to aid in its enforcement by reporting violations of it.”¹ Definitions and punishments for academic misconduct including cheating, plagiarism, et al. are described in the Student Handbook. I will follow the letter and intent of the Rules and Procedures regarding academic misconduct. Students will receive a zero on any assignments where academic misconduct has occurred, and further actions may be taken including the assignment of a penalty grade for the course. All instances of academic misconduct will be reported to both the Dean of Students and the Head of your academic department.

“Every scientific publication must include the proper attribution of the contributions of others by appropriate referencing and the placement of results within the context of the research field. Referencing is a complex subject (see Chapter 14 of this volume). Every reference in the field cannot be cited, or the reference list would become intolerably long. However, important ideas and experiments must be cited. ... If data are presented that have been previously published, this should be clearly indicated. Direct quotations of more than a few words should be indicated by quotation marks and referenced. Paraphrases of quotations also should be referenced. Plagiarism—taking the writings or ideas of another and passing them off as one’s own—of any type represents unethical conduct.”²

It is my belief that you have covered proper citation methods in earlier classes at RHIT. If you have specific questions, please come see me and/or get help from the RHIT Learning Center. When completing any homework or written assignments that require referencing, I would prefer that you follow the standard ACS guidelines. Rose-Hulman has access to an electronic version of the *ACS Style Guide* (<http://pubs.acs.org/styleguide>), and I have a copy in my office that you may check out on a night-by-night

¹ *Discipline*. Rose-Hulman Registrar’s Office. <http://www.rose-hulman.edu/offices-and-services/registrar/rules-procedures/discipline.aspx> (accessed 30 August 2016).

² Hammes, G.G. *Ethics in Scientific Publication*. In *ACS Style Guide*; 3rd ed.; Coghill, A.M., Garson, L.R., Eds.; American Chemical Society: Washington, DC, 2006; p 7.

basis. Specific chapters on ethics (Ch. 1) and referencing (Ch. 14) are also available for download on the course Moodle site.

Course Participation Policy

We will meet four times a week for lectures sessions. So long as you are able, your attendance and active engagement in these activities is expected. If you are forced into quarantine or have other life events appear, we will work together to find solutions that will keep you engaged in the course. If any issues arise, please communicate them with me so I can plan accordingly.

Office Hours & Availability

The best way to contact me is via email (poland@rose-hulman.edu). I will only reply to emails during business hours and can guarantee a reply within one business day.

I will have set office hours each week on Tuesdays from 1:00–1:50 PM and Thursdays from 1:00–2:50 PM. Location is still TBD – I'll update as soon as I can. It's almost guaranteed that you'll want some help outside of these times, though. For these times, so long as I am able, I'm happy to help! Please email me to set up an appointment.

Access to Grades

Grades will be updated throughout the term using the course's Moodle grade book. This grade book can be accessed from the Moodle Navigation Drawer on the left-hand portion of your browser window. MasteringChemistry homework and quiz grades will be synced to Moodle on at least a weekly basis. Please note that it is not an automatic sync between platforms, and delays are to be expected.

VIPEr Fellows Project

In coordination with the Interactive Online Network of Inorganic Chemists (IONIC), the Virtual Inorganic Pedagogical Educational Resource (VIPEr) Fellows project is supported by a 5-year grant from the National Science Foundation's Improving Undergraduate STEM Education (IUSE) program. A primary project goal is to develop, test, and refine a flexible, foundation-level inorganic chemistry course based on classroom observations, analysis of student work, surveys of students, and interviews with faculty. Your instructor has been chosen as a VIPEr Fellow (Cohort 2) for AY21-23, and as such, there will be several surveys and recorded sessions that accompany this project. If you have any questions, please refer to the Participant Notice for Students form or ask your instructor. The research team will analyze this data to study the effects that student-centered active learning pedagogies and support from a community of practice has on student learning and instructional practice.

Late Assignments

If and when you are able, I would appreciate all assignments to be completed on time in order to help facilitate me giving you fast grading feedback. I recognize that, in the age of COVID-19, this is not always possible. If you anticipate being unable to complete an assignment or turn it in on time, **please let me know via email as soon as possible**. You are expected to make every reasonable attempt to avoid missing major assignments (e.g., Exams). I have tried to provide you with ample time to complete each. **In the absence of communication regarding late or incomplete work**, the assignment will receive a zero (0) in the grade book.

If you would like to review and/or dispute any grading on tests or quizzes, you must wait at least 24 hours after the quiz/exam is returned to you before approaching me with your concerns.

Class Etiquette

Please be respectful of both your fellow classmates and me. Avoid disruptive behavior.

Caveat

I reserve the right to change the policies, schedule, topics, etc. outlined in this syllabus.