THE UNIVERSITY OF TEXAS AT TYLER

SPRING 2024

CHEM 3320.001 Inorganic Chemistry

Dr. Jason Smee

Contact Info

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- RBS 3030

Howdy (Office) Hours

- MWF 9:45-11:30 am
- and by appointment

Inside the Syllabus

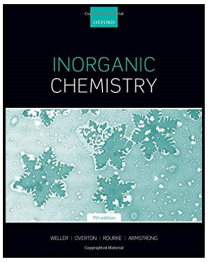
Course Description

This is an introductory inorganic chemistry course, which will focus on basic areas such as periodic trends, coordination chemistry, kinetics and mechanisms of inorganic reactions, simple bonding theories, and solid-state inorganic chemistry. A more complete list of topics is shown later in the syllabus. Fundamental topics from General Chemistry will also be reviewed and expanded in the context of inorganic chemistry. (*IF* time permits, we may also cover the often overlooked area of lanthanoid/actinoid chemistry).

"I think chemistry is being frittered away by the hairsplitting of the organic chemists; we have new compounds discovered, which scarcely differ from the known ones and when discovered are valueless—very illustrations perhaps of their refinements in analysis, but very little aiding the progress of true science."

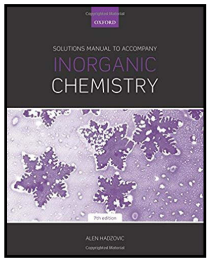
— Michael Faraday (ca. 1845)

Required & Recommended Materials



The **recommended** text is *Inorganic Chemistry* 7/e by Weller et al. ISBN-13: 9780198768128.

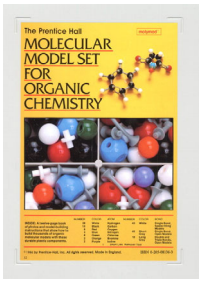
(6/e acceptable, some chapter numbers have changed)



The *Solutions Manual to Accompany Inorganic Chemistry 7/e* is **recommended**, but not required. ISBN-13: 9780198814689.

A scientific calculator (capable of exponents and logarithms) is **required**.

Achieve homework account is **required**. Cheapest option is to purchase online. See page 3 for details.

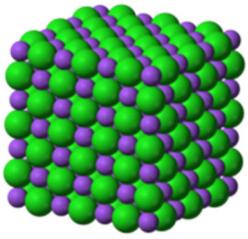


An organic/inorganic model kit (a common example is shown at left) is **recommended**, but not required. If you purchase one, make sure at least two of the atoms are six-coordinate.

Student Learning Outcomes

By the end of this course, students should be able to

1) correctly name inorganic compounds (both main-group and coordination compounds)
2) describe, identify, and draw the various isomers commonly formed by coordination compounds
3) utilize bonding theories to predict the effects of charge, electron configuration, and the types of ligands on the structure and reactivity of coordination compounds
4) calculate crystal field stabilization energies and magnetic moments from electron configurations
5) describe and/or calculate the properties of various types of crystal lattices
6) predict and identify periodic trends such as effective nuclear charge, the inert pair effect, the uniqueness principle, and the diagonal effect



Structure of NaCl represented as a series of green (Cl) and purple (Na) spheres.

"Chlorine is a deadly poison gas employed on European battlefields in World War I. Sodium is a corrosive metal which burns upon contact with water. Together they make a placid and unpoisonous material, table salt."
~ Carl Sagan

Canvas

I will utilize Canvas to post the following items

1) syllabus
2) lecture notes & recorded lectures
3) due dates for Sapling homework assignments
4) grades (my Excel grade book is the official grade book)
5) links to tutorial videos
6) links to interesting websites

Course Requirements

1) CHEM 1312/1112 (General Chemistry II and Lab) is a pre-requisite.
2) CHEM 3121 (Inorganic Chemistry Lab) is required to fulfill degree requirements; if CHEM 3320 is taken as an elective then the lab is not required.
3) CHEM 3342/3143 (Organic Chemistry I and Lab) is helpful, but ***not required***.
4) We meet Tuesday and Thursday from Jan 17 to April 25 at 8 am in RBS 2015 (except during Spring Break).
5) You must take the standardized final exam (Tuesday, April 30th) to pass the class.

Attendance!

- I will take attendance in this class by sign in sheet. Please participate!!!!
- The more you participate, the more you will get out of class!
- *Each exam will have a review session **IF** class attendance is ≥ 75% for the days that exam's material covers. Otherwise NO REVIEW session and you will need to come to my office to ask questions on exams.*

Grading

- The official gradebook is the Excel file on my desktop computer (in case Canvas has issues).
- Achieve assignments will be shown on Canvas.
- Grades will be tentatively based on a 90/80/70 scale, but may be adjusted based upon my evaluation of the class's overall performance.

Homework	**25%**
3 "In-class" exams	**60%**
Cumulative final exam	**15%**
Total	**100%**

Homework (25% of course grade: 10% in class, 15% Achieve)

There will be short, in-class, group assignments that make up 10% of your grade. The other 15% of the homework portion will be assigned through the Macmillan Achieve platform ($47). Don't panic! I promise it is MUCH easier than in Analytical.

- Homework will be due 5 days after finishing the chapter's material. This class meets Tuesday and Thursday, so due dates are either Sundays or Tuesdays.
- All assignments will be posted on Canvas. Please try to complete homework assignments on time. Microsoft Edge may not work; you may want to try other browsers (Chrome, Firefox, etc.). Mobile devices don't play well with Achieve; desktop computers, laptops, or tablets are recommended.
- Do not buy "USED" Achieve access codes, they probably won't work!

To enroll in the Achieve section for this course follow the steps below

- Navigate to the Achieve Access Module on Canvas and click on Achieve Home to connect your Canvas and Achieve Accounts.
- Follow these instructions for help connecting Achieve through Canvas.

Other helpful links

- Disable browser pop-up blockers and refer to the troubleshooting guide if you experience any difficulty accessing Achieve.
- Browse Achieve: Getting Started Guide for Students
- Contact Macmillan Customer Support

Achieve
macmillan learning

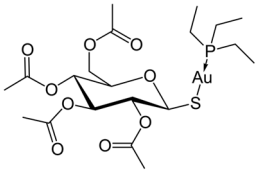
Exams (60% of course grade for midterms; 15% for final exam)

1) The three, in-class, midterm exams are worth 60% of your overall grade. They will be mostly multiple choice and some short answer/calculation questions. I'll inform you where each exam's material will be cut off one week in advance.
2) You are permitted a note card for each exam (3 x 5 inch, both sides), but it must be handwritten, no printouts or photocopies.
3) I will also have review sessions (synchronous) and they will be recorded.
4) In the event of an excusable situation, please give me 2+ days' notice to reschedule your exam. Missed exams for unexcused reasons may result in a 0.
5) The final exam (Tuesday, April 30th) will be an ACS Nationally Standardized exam. The final is 15% of your grade and is required to pass the class.
6) Because the final is comprehensive, it will be used to replace your lowest midterm exam grade (assuming the final exam is not your lowest exam grade).

Alfred Werner "Father of Coordination Chemistry" 1913 Chemistry Nobel Prize

"Will fluorine ever have practical applications? It is very difficult to answer this question… A scientific research is a search after truth, and it is only after discovery that the question of applicability can be usefully considered."

— Henri Moissan, discoverer of F_2



Auranofin™ is a gold compound used to treat arthritis. It is one of only a hand-ful of FDA-approved, metal-based drugs.

"Poison is in everything, and no thing is without poison. The dosage makes it either a poison or a remedy."

~ Paracelsus, 16th century alchemist

Trisenox® (arsenic trioxide) injection

As_2O_3 while toxic has been shown to be therapeutically useful in the treat-ment of acute promyelocytic leukemia.

Important Dates (Note: midterm exam dates are tentative; final exam date is fixed)

- January 29 (Monday): Census Date; last day to file for grade replacement
- **February 13 (Tuesday): Exam 1**
- March 1 (Monday): FINAL day to apply for Spring graduation
- March 11–15 (M – F): Spring Break, no classes
- **March 21 (Thursday): Exam 2**
- March 25 (Monday): Last Day to Drop with a "W"
- **April 23 (Tuesday): Exam 3**
- **April 30 (Tuesday): Final Exam, 8:00 am – 10:00 am in RBS 2015**

Topics to Be Covered (listed by chapter in the textbook, 7/e)

- Chapter 5.1 – 5.16: Acids and Bases (Skip sections 5.5, 5.8, 5.11, and 5.17)
- Chapter 7: Introduction to Coordination Chemistry (nomenclature, structures, isomers, formation constants, and chelate effect)
- Chapter 20.1 and 20.8-20.9: Electronic Structure (Crystal Field Theory, spectrochemical series, Crystal Field Stabilization Energies, magnetic moments, Jahn-Teller effect, and magnetic coupling)
- Chapter 21 + outside material: Coordination Chemistry Reactions (reaction types, ligand substitution reactions/mechanisms, and redox reactions)
- Chapter 27 + outside material: Medicinal Inorganic Chemistry (treatment of cancer, arthritis, bipolar disorder, and HIV; chelation therapy and imaging agents)
- Chapter 4 + outside material: Structure & Energetics of Simple Solids (unit cells, alloys, salts, lattice energies, Born-Haber cycles and defect structures); Band Theory; Semicon-ductors
- Chapter 9 + outside material: Periodic Trends (radii, EN, IE, EA, uniqueness principle, diagonal effect, and inert pair effect)
- Chapter 10: Hydrogen & Hydrides (production, reactions, types of hydrides)
- Chapter 6.1-6.4, 6.9, 6.12-6.14: Redox Chemistry (Latimer, Frost, & Pourbaix diagrams)
- Chapter 3.1: Symmetry Operations, Elements, and Point Groups
- Time permitting: Chapters 11—18: Selected topics related to main group elements

Top 10 Reasons to Study Inorganic Chemistry*

10. There's more to the periodic table than the first 3 rows.
9. The COLORS…*Oooooo*…
8. Gloveboxes give you an excuse to say "Smell my finger…"
7. What's just one more ligand…?
6. I'm just one reaction away from discovering a room-temperature superconductor…I swear…
5. Octahedral geometries are easier to draw.
4. COT has more bite!
3. Something about "nano"…
2. Carbon is over-rated.
1. I know how to count higher than 8!

*List taken from **https://www.cafepress.com/mf/13342360/top-10-reasons-to-study-inorga_tshirt?productId=69337098**

Tentative Lecture Schedule (*Very* Tentative)

Date	**Topic**
Week 1 Jan16/18	Syllabus; Chapter 5 (Acids and Bases); start Chapter 7 (Intro to Coordination Chemistry)
Week 2 Jan 23/25	Continue Chapter 7
Week 3 Jan 30/Feb 1	Finish Chapter 7
Week 4 Feb 6/8	Start Chapter 20A (Electronic Structure)
Week 5 Feb 13/15	Continue Chapter 20A; **Exam 1**
Week 6 Feb 20/22	Finish Chapter 20A; start Chapter 21 (Coordination Chemistry: Reactions of Complexes)
Week 7 Feb 27/29	Finish Chapter 21
Week 8 Mar 5/7	Chapter 27 (Medicinal Inorganic Chemistry)
Week 9 Mar 12/14	**Spring Break—No classes!!!!**
Week 10 Mar 19/21	Start 4 (Structures of Simple Solids); **Exam 2**
Week 11 Mar 26/28	Continue Chapter 4
Week 12 Apr 2/4	Finish Chapter 4; start Chapter 9 (Periodic Trends)
Week 13 Apr 9/11	Finish Chapter 9; Chapter 10 (Hydrogen/Nuclear Chemistry); start Chapter 6 (Redox Chemistry)
Week 14 Apr 16/18	Finish Chapter 6; Chapter 3.1 (Symmetry Operations, Elements, and Point Groups)
Week 15 Apr 23/25	Chapters 11-18 (selected topics from Groups 1A to 8A); **Exam 3**