STRUCTURE AND PROPERTIES OF INORGANIC COMPOUNDS

Contact info

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Office Hours:
M 1 PM – 3 PM
W 11:30 - 1 PM
R 2- 4 PM
Other times by appt

Course Materials

Chemistry: An Atoms-Focused Approach Gilbert, Kriss, and Foster from Norton Publishing (also available as an eBook, see email)

Laboratory Notebook with duplicate pages

Lab Times

Lab (9:10 am section)
T 12:40- 3:30 pm
Lab (10:20 am section)
R 8:30 am - 11:30 am
Labs are held in JSM 358/356

The study of inorganic substances is important for understanding a variety of other sciences and for an appreciation of the chemistry that permeates our everyday lives. Inorganic chemistry allows us to understand why lead in the water in Flint, Michigan is dangerous to childern, how inorganic vanadium compounds can be harnessed to store energy from wind power, how platinum compounds can work as anticancer drugs, how metal-organic frameworks can serve to store H_2 or CO_2, how a catalytic converter makes auto exhaust cleaner, how the lithium used in our electronics batteries is isolated from its ore and altered chemically to power the products we use everyday. Our goal is to learn together about the properties and reactions of inorganic substances well enough to be able to apply them to understand the many fascinating applications of inorganic chemistry both in chemistry and in fields such as geology, art, medicine, biology, and environmental science.

Important core concepts we will learn are atomic structure, spectroscopy, molecular structure, bonding, and reactivity. We will be building the tool-kit of a scientific "expert" and learning to put together ideas in new (and maybe less initially intuitive ways). You will learn to "think like an inorganic chemist" –this means asking (and answering!) the kinds of questions that chemists ask about inorganic substances. You will get lots of chances to practice this as the semester goes on!

Course Goals

- Recognize and represent inorganic substances using molecular structures, symbols and systematic nomenclature and understand these representations as a chemist would
- Acquire the language and definitions of inorganic chemistry and be able to apply them
- Describe and predict atomic structure and periodic properties of atoms and ions based on the periodic table
- Describe the various models of structure and bonding in covalent, ionic, and metallic substances and use them to predict properties of inorganic compounds and understand how they differ from one another
- Describe, recognize, and predict the products of the major types of inorganic reactions: acid/base, precipitation, redox, and complexation
- Appreciate the role that spectroscopy plays in characterizing inorganic substances
- Synthesize information from the bullet points above to solve more complicated problems
- Appreciate the potential of inorganic chemistry for understanding the world around us and see these real-world problems from the perspective of a chemist
- Find relevant chemical information in the library and/or on the internet
- Develop practical laboratory skills to synthesize and analyze inorganic compounds.
- Design your own chemical experiments to test hypotheses and interpret the data to understand chemical concepts
- Express scientific thoughts clearly in written form: in the lab notebook, lab reports, short writing assignments, and essay questions

Grading

The grading for the course is broken into the following areas:

In-Class Exams: 36% (12% for each exam)

Cumulative Final exam: 24%

Laboratory: 20%

Homework Assignments (electronic, paper, etc): 7%

Quizzes: 8% (12 total, I count 10)

Participation (attendance, promptness and appropriate behavior in lab, in class Socrative response system, answer questions when called upon): 5%

Grading Scale

A	93-100	C	73-76
A–	90-92	C–	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B–	80-82	D–	60-62
C+	77-79	F	Below 60

You must pass both the classroom and the laboratory in order to pass the class.

You can check your current grade in the class on Moodle.

Course Outline

The weekly course outline is available on the course website which is accessible through http://thecreativechemist.org/chem-130/. **Please check each week for reading assignments, problem sets, quizzes etc. This will be updated weekly and is subject to change.**

Important Dates:

Exam 1: Friday, Feb 24

Exam 2: Friday, Mar 24 (note: day before spring break)

Exam 3: Friday, April 28

Cumulative Final Exam: Mon, May 15 (9:10 am section), Tues, May 16 (10:20 section)

Attendance and Attention

Attendance is important! Unavoidable absences due to travel for athletic or other university sanctioned events can be excused, but you **must notify me in advance**. If you are going to miss a lab or exam it is your responsibility to contact me at least **7 days** before the class you will be missing.

If you miss class, it is your responsibility to check with your classmates in order to find out what happened in class. The answer to the question "did I miss anything?" may be found here:

www.library.utoronto.ca/canpoetry/wayman/poem5.htm

Several times each day I will ask questions using the Socrative platform and ask you all to participate. This in class testing will help me see how the class is understanding concepts as a whole, check where individual students are with respect to their understanding, and give quiet and/or more reticent students a chance to respond in the class.

In order to get your Socrative participation points, you will need to participate whenever there is a question asked in class. You will not be graded on the correctness of your answer, but you will be graded on classroom engagement. This means that you need to be in class and make an effort to answer those questions in order to get those points. However, I expect electronic devices to be closed or turned upside down when we are not expressly using them.

Socrative Homework

A portion of your homework grade will be based on online "warm up" activities based on the previous class period and interleaved activities from previous classes. These graded problems are designed to keep you current with the material so that we can build on it in the next class period. It also allows me to see where broader misconceptions are and spend time in class discussing them. In some cases I will interleave older material to make sure that you still can do those problems. This intentional "review as we go" will help you retain more information and be better

Course Outline

Note that this schedule is subject to change to incorporate areas of interest as the semester evolves! Exact schedule is provided on the Week by Week outline on the course website.

Week 1 Introduction, periodic table, chemistry basics

Week 2 Nomenclature, spectroscopy, basic types of inorganic reactions

Week 3 , Bohr model, Quantum theory, atomic orbitals electron configurations,

Week 4 Periodic properties

Week 5 Lewis dot structures, resonance, formal charges

Week 6 Valence bond theory, hybridization

Week 7 MO Theory, Solid state structures

Week 8 Ionic and metallic bonding

Week 9 Semiconductors and band theory, Intro to acids and bases

Week 10 Acid base reactions (con't)

Week 11 Redox

Week 13 Coordination Chemistry

Week 14 Bonding in coordination chemistry, Bioinorganic chemistry

equipped to combine ideas on more complicated in class problem sets and exams.

Late Days and Missed Work

All assignments (laboratories, homework, electronic problem sets via Socrative) are to be turned in during the class that they are due (and in the manner specified). For lab reports **only** you have two "late days" which you may use as needed during the semester. For instance, if a lab report is due on a Tuesday, but you have a big exam on Tuesday, you can use a late day and turn a lab in on Wednesday. Please note, however: a "day" is twenty-four hours long. If you don't give me the assignment until Thursday morning, that counts as two late days. Please note that because these late days are freebies, I will give no extensions on assignments. Any late days beyond these two days (or lateness without prior notification) will count against your grade. Late work is subject to 10% penalty per day. Missed Socrative assignments and other homework are each worth small amounts so the final tally will be taken out of a slightly lower number (the equivalent of one In Class Assignment or about 2 Socrative homework to account for an occasional missed assignment there.

Statement of Inclusivity

I strive to make this class an inclusive learning community, respecting those of differing backgrounds and beliefs. As a community, we aim to be respectful to all citizens in this class, regardless of race, ethnicity, religion, gender or sexual orientation.

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct me on your preferred gender pronouns. If you have any questions or concerns, please do not hesitate to contact me.

I am committed to making course content accessible to all students. If English is not your first language and this causes you concern about the course, please speak with me.

Accommodations

It is the policy and practice of DePauw University to provide reasonable accommodations for students with properly documented disabilities. Written notification from Student Disability Services is required. If you are eligible to receive an accommodation and would like to request it for this course, please contact Student Disability Services. Allow one week advance notice to ensure enough time for reasonable accommodations to be made. Otherwise, it is not guaranteed that the accommodation can be provided on a timely basis. Accommodations are not retroactive. Students who have questions about Student Disability Services or who have, or think they may have, a disability (psychiatric, attentional, learning, vision, hearing, physical, medical, etc.) are invited to contact Student Disability Services for a confidential discussion in Union Building Suite 200 or by phone at 658-6267. You are welcome to talk to me privately if you have a need to discuss course requirements and your needs for accommodation.

DePauw accommodates students who are adherents of a religious tradition and wish to fulfill obligations of that religious tradition on holy days. Students are expected to notify their instructors of their intent to fulfill the obligations of their religious tradition well in advance of these days. For the sake of this policy, "holy days" are defined as periods of time in which either: activities required by normal class participation are prohibited by a religious tradition, or a special worship obligation is required by a religious tradition. For this class I ask that you notify by e-mail at least 14 days in advance of the date in question.

Academic Honesty

Learning is frequently greater if you can work with others in this class to master the material. I encourage you to work on problem sets and other assignments with other people in this class. There are many times when I will encourage collaboration between students to facilitate learning, while there are other times when I will clearly indicate that students are required to work alone to complete an assignment. **Tests, quizzes, and writing assignments must be your work and your work alone.** Sources of material should be properly cited and you should take care not to plagiarize from outside sources, electronic or print. If you are ever unclear about how an assignment is to be completed, please ask me! The penalties for academic dishonesty are outlined in the Student Handbook:

http://www.depauw.edu/academics/academic-resources/academic-integrity/

Additional Chemistry Courses

Those students considering majoring in Chemistry or Biochemistry or who are interested in taking additional chemistry courses in the future should consider registering this semester for Chemistry 170, Stoichiometric Calculations if they haven't done so already. This is a self-paced, 0.25 credit course covering basic chemical calculations such as mole conversions, yields, solutions and gas laws. Chemistry 170 is a pre-requisite for Chemistry 260, Thermodynamics, Equilibrium and Kinetics. After you complete Chemistry 130, the courses you can take are Chemistry 120 (Structure and Properties of Organic Compounds), and Chemistry 260 (Thermodynamics, Equilibrium and Kinetics). You and your advisor (or any member of the Chemistry Department) can discuss which course(s) are most appropriate for your major and career objectives. You can visit the Chemistry Department web site for additional information on the chemistry curriculum.

VIPEr

I am a founding member of IONiC: the Interactive Online Network of Inorganic Chemists. We have funding from the National Science Foundation to forge a community of practice for the teaching of inorganic chemistry and develop an on-line resource for the inorganic chemistry community (http://www.ionicviper.org). If you have read this far, good for you! If you send me via email your favorite

favorite meme, song and/or artist before the next class meeting, I will give you five extra homework points.

Periodically, you will see "learning objects" that are marked with some reference to VIPEr. These are teaching materials developed by my collaborators and/or me that I am adapting and testing. I may post feedback on VIPEr to inform the author and other users, but rest assured that any comments I make will not identify individual students.