Instructor: Prof. Rory Waterman Innovation E331
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Lecture: MWF 12:00–12:50, Innovation E102 or via MS Teams

Office hours: Tuesdays and Thursdays between 1:00–2:30 PM. You can easily book times via Navigate or contact me to make an appointment. Any meetings out of class will be remote via MS Teams or phone.

Inclusion in science: In the Department of Chemistry, we have agreed that sharing our thoughts on inclusive science is important as a part of our ongoing commitment to equity in access and diversity throughout our field.

Here are my thoughts: First, you are welcome and belong in this class and in chemistry. Science should be inclusive because the activity itself is identity independent. Sadly, that is not true because people do science, and our disciplines have been built on privilege that has impacted access to education, information, resources, opportunity, and voice.

My education is a result of privilege and came at a time when science successfully GLVPLVVHG LQFOXVLRQ LH µVFLHQFH LV EOLQG¶ EDG curve for creating and supporting an inclusive scientific enterprise. Nevertheless, I value all identities including race, ethnicity, sex, gender identity, ableness, nationality, sexual orientation, religion, economic status, age,

A general overview of inorganic chemistry. Topics include bonding, molecular structure, periodic properties, symmetry, main-group and transition-metal (including organometallic) chemistry and bioinorganic systems.

Things are a little different this year with an in-person section and an at-home section. While the objectives and course content will be identical, some of the activities and assessments must be different to accommodate for the remote students. In some cases, students will be able to toggle between those modalities. For example, students who are under quarantine should attend the class via the link on Teams. However, student may not elect to mix and match between the remote and in-person pieces. Substitution of assessments, for example, comes only with instructor permission in advance.

As communicated by email, some Wednesday classes will be entirely virtual, which is an unavoidable consequence of childcare obligations. I will communicate those in advance.

Course objective My goal is that students who complete this course should be able to use some basic inorganic concepts, broadly defined, to enable problem solving in other fields. To address that goal, one should understand bonding across inorganic systems, the interplay of symmetry and physical properties, transition metals and main group elements. To meet that goal, we should investigate the inorganic chemistry in applied fields like catalysis and energy conversion.

Learning outcomes The course is broken into several parts (up to five, if all goes well). Each section will have a set of specific objectives associated with it. Those documents form a roadmap for the course. If you understand what the content of the objectives and can perform the skills, then you are learning the course material. We will get to that point by using class time to review concepts and for you to do exercises and activities that reinforce those ideas and practice skills. That plan will work if you engage in course materials (the book, homework, or other provided materials) before or after a given class, as prescribed.

Basic outline
I. The basics of inorganic chemistry
II. Transition-metal chemistry
III. Catalysis
IV. Energy

Important dates:
Monday, March 1, exam 1
Monday, March 29, exam 2
Monday, April 26, exam 3 20, exam 2
Wednesday, May 5 R S W L R Q exam R 1 deadline S´
Monday, May 10, last day of class
Final exam date: May XXX TBA by Registrar

No class Wednesday, March 24 (respite day)

Text: Inorganic Chemistry by Miessler, Fischer, and Tarr (ISBN-13: 978-0-321-

Quizzes Short quizzes will be given at the beginning of a class most weeks. Because we shall cover a few days of material, the day of the week may change. The quizzes are based on fundamental material covered in lectures over the previous classes and thus intended to help you see what topics are important.

Problem Sets Problem sets will be given approximately weekly. Solutions will be provided, and these will not be graded completely. Only one question per problem set will be graded,

1. Demonstrate general knowledge in chemistry across all subdisciplines and be able to apply chemical and physical principles in the solution of qualitative and quantitative chemical problems.
2. Solve qualitative and quantitate problems by developing a rational strategy, including the ability to estimate the solution and test the validity of the solution.
3. Demonstrate proficiency in experimental chemical techniques and be able to apply these to practical and current problems in research.
4.

Outline

I. The basics of inorganic chemistry
- A. Recap of Lewis structure & VSEPR
- B. Point symmetry
- C. Molecular orbital theory
- D. Periodic trends
- E. Lewis acids, hard-soft concept, and frustration

II. Transition-metal chemistry
- A. Metals: Who they are and what they do
- B. Electronic structure of metals
- C. Reactions at transition metals
- D. Moving electrons/metals doing work

III. Catalysis
- A. Catalysis, chemistry that affects all of us
- B. Taming the organometallic beast
- C. Solid-state: oil processing and catalytic converters
- D. Homogeneous catalysis: reactions to make drugs and useful things

IV. Energy (if we get this far)
- A. Solar cell technology
- B. Solid-state refrigerant
- C. Making hydrogen

Key skills

- Identify point symmetry of molecules
- Interpret MO diagrams for simple molecules
- Identify d