

CHEM 4701
Inorganic Chemistry

M W F 12:20 – 1:10 pm
331 Smith Hall

Instructor: Professor Ian Tonks
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Office Hours: Mon 2:30-3:30 pm; Tues 4:00-5:00 pm (or by appointment if necessary)

TA: Adam Pearce; pearc131@umn.edu
Dr. Arijit Koley; akoley@umn.edu (MPACT Scholar)
Office Hours: Thurs 4 pm (Adam, Location TBD)
Weds 4 pm (Arijit, Location TBD)

Course Materials: G. L. Miessler, P. J. Fischer, D. A. Tarr, *Inorganic Chemistry* (5th edition)
(Required) iClicker2 (Bookstore) OR Smartphone REEF poller (\$\$ subscription)

Course Materials: D. C. Harris, M. D. Bertolucci, *Symmetry and Spectroscopy*
(RECOMMENDED) R. L. DeKock, H. B. Gray, *Chemical Structure and Bonding*

Coverage: The goal of this course is to provide an introduction to inorganic chemistry specifically regarding periodic trends, bonding theory, molecular symmetry, atomic and molecular orbitals, and coordination compounds.

Email Policy: All CHEM 4701 emails must start with [CHEM 4701] in the title.

I receive upwards of 100 (work-relevant) emails a day. I will do my best to respond to class-related emails within 24 hours of receiving them, however, keep in mind that during high volume times (near exams) this may not be possible. Please try not to wait until the last minute to ask questions via email. Please do not email me with questions that can be answered in tutor hours or by properly reading the syllabus. My email answering time is 10:00 am to 10:00 pm M-F.

COURSE STRUCTURE AND GRADING EXPLANATION:

In-class exams: 525 Points (175 each)

In-class clicker participation: 50 Points (completion; 80% clicker points = perfect score)

In-class "quiz" activities: 100 Points (20 each, drop lowest)

Final exam: 325 Points

1000 total points:

The *maximum* cutoffs will be as follows (i.e. no matter what, if you get an 85% you are in the A-range). I will keep the class updated on curve-related matters after each exam.

A-range: 85-100%

B-range: 75-85%

C-range: 60-75%

D-range: 45-60%

Exams: There will be 3 in-class midterm exams and one comprehensive final exam. All exams will be closed-book. NO notes, model kits, calculators and mobile electronic devices will be allowed.

Exam 1: In class, Friday Feb 17

Exam 2: In class, Friday Mar 24

Exam 3: In class, Friday Apr 21

Final Exam: Tuesday May 9 2017 Location TBD

Clicker Participation: We will be doing various types of clicker questions in class. These questions will be graded for participation, not correctness. If you answer 80% of the clicker questions over the course of the semester, you will earn the full 40 possible points. The 20% buffer is designed to account for days where students forget their clickers, are sick, run out of batteries, excused absences, *etc. etc.* You must register your iClicker or REEF poller with Moodle to receive full credit: instructions can be found at <http://z.umn.edu/iclickerstudent>. Our clicker class frequency is AA.

Problem Sets: Recommended problems from the textbook will be posted for each chapter to give you extra practice and review, though these will not be graded. It is **HIGHLY RECOMMENDED** that you work the suggested book problems. The answer key is available online for M&T at <https://www.pearsonhighered.com/chemistryresources/>

There are additional homework problems in H&B and D&G. I find the H&B problems particularly helpful for understanding symmetry/group theory and electronic spectra.

LEGAL STUFF:

Policy on Additional Time or Special Needs for Exams: If you have a *documented* condition that allows additional time for exams or need other special assistance, you are responsible for contacting with Disability Services (<http://ds.umn.edu/>) immediately and schedule to take your exams with a proctor at their office. You need to schedule these well in advance: exam dates are above, so get started right away. Prof. Tonks and the proctors are NOT responsible for students who fail to adequately prepare to use or schedule use of disability services. Neither the TAs nor I are certified to proctor exams for students with additional needs. If you do not prepare adequately, you'll be treated like everyone else – no exceptions.

Policy on Re-grades: 1) To qualify for a re-grade, you must take the exam in ink and *not* use white-out. 2) Re- grades must be submitted 48 hours after the exams are handed back. 3) If you want a re-grade, you must submit *in writing* your argument for what you feel was graded incorrectly. Feel free to draw pictures and refer to the class textbooks, handouts, or notes. If you do refer to the textbook or solution guide, give the relevant pages. 4) I reserve the right to re-grade the entire exam if you ask for a re-grade. One exception to all of the above: If an arithmetic error in your point tally has occurred, affix a cover note with the words “tally error” on it and the re-grade will be accepted as is.

Scholastic Dishonesty: Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course or a “Zero” for a quiz/exam. At a minimum, if a proctor or I have sufficient evidence for academic dishonesty, I will present that evidence to the Office for Student Academic Integrity and the college the student is enrolled. (<http://www1.umn.edu/oscai/>) If you have any questions regarding the expectations for a specific assignment or exam, ask.

Policy on “I” Grade: Departmental policy is that a student may request an Incomplete grade only when (a) he or she has a University-sanctioned excuse for missing the final exam and (b) he or she is passing the course based on all other graded components. Assignment of an I requires that the instructor and student sign a contract, available in the Departmental undergraduate office, stipulating the procedure by which the I grade will be made up (e.g., taking a final exam from another instructor in the next semester). Failure to successfully complete the procedure outlined in the contract will result in the I being administratively changed by the University Registrar.

Make Up Work for Legitimate Absences: Selected from the Administrative Policy for Legitimate Absences:

- 1) “Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include illness of the student or his or her dependent, participation in intercollegiate athletic events (see the Administrative Policy: *Intercollegiate Athletic Events during Study Day and Finals Weeks: Twin Cities*, which prohibits intercollegiate athletic competition during study day and finals week except under certain circumstances), subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances also include activities

sponsored by the University if identified by the senior academic officer for the campus or his or her designee as the basis for excused absences. The instructor has the right to request verification for absences. Such circumstances do not include voting in local, state, or national elections.”

- . 2) “It is the responsibility of students to plan their schedules to avoid excessive conflict with course requirements.”
- . 3) “A student must notify instructors of circumstances identified in (1) as soon as possible and provide documentation requested by the instructor.”
- . 4) “If a student is absent due to circumstances identified in (1) and has complied with the notification requirement, the instructor may not penalize the student and must provide reasonable and timely accommodation or opportunity to make up exams or other course requirements that have an impact on the course grade.”
- . 5) “The instructor has primary responsibility to decide if an absence is due to unavoidable or legitimate circumstances.”
- . 6) “Instructors are expected to accommodate students who wish to participate in party caucuses”
- . 7) “This policy applies to all course requirements, including any final examination.”
- . 8) “Colleges and academic units may establish specific criteria for notice and completion of work to implement this policy.”

If the above conditions are met:

Missed Exams Due to Legitimate Absences: Student(s) missing the exam and I will find a date and time as close as possible to the exam time to take a make-up exam. Nights and weekends will be considered. The questions on the make up exam will *not* be identical to the in-class exam, for obvious reasons.

Student athletes should inform me ASAP of all potential conflicts for exams. I do not allow student athletes to take a proctored exam while traveling, they have to take the make-up on campus.

All make-up exams will be scheduled *prior* to the normal exam date. Students who miss exams will be handled by a situational basis.

APPROXIMATE CLASS SCHEDULE:

Class	Date	Topics	M&T Reading	Extra Reading	Suggested HW Problems
1	1/18	Intro	1 & 2		
2	1/20	Lewis structures, periodic trends, and VSEPR	2.3, 3.1 & 3.2	D&G 1 & 2	3.1-3.7, 3.8-3.11, 3.40-3.44
3	1/23	Symmetry elements	4.1 & 4.2	H&B 1.1-1.5	
4	1/25	Symmetry elements + point groups			4.1-4.9, 4.13, 4.39 (Draw symm ops on molecules)
5	1/27	Quiz 1 – Point group practice			
6	1/30	Matrices and simple irreducible reps	4.3	H&B 1.6-1.8	
7	2/1	Character tables – Mulliken symbols			4.20-4.23
8	2/3	Vibrational spectroscopy	4.4	H&B 3	4.28-4.29, 13.22-13.23 (Draw out vibrations)
9	2/6	Vibrational spectroscopy			
10	2/8	Intro to molecular orbitals, diatomics	5.1 & 5.2	D&G 4 H&B 4.4-4.5	5.1-5.4
11	2/10	Quiz 2 – Character tables and MOs			
12	2/13	Heterodiatomic molecular orbitals	5.3	H&B 4.6	5.7-5.9
13	2/15	Catchup and review			
EXAM	2/17	EXAM 1: Coverage Ch 1, 2, 3.1 & 3.2, 4, 5 thru 5.3			
14	2/20	Multinuclear MOs SALCS/LCAO	5.4	D&G 5	
15	2/22	Multinuclear MOs Projection operators BH ₃ , B(NH ₂) ₃			5.16-5.20
16	2/24	Quiz 3 – Multinuclear MOs			
17	2/27	CH ₄ and SF ₆ – hybridization is a lie			5.26-5.28, 5.31-5.35
18	3/1	Coordination chemistry – types of ligands	13.1-13.2, handouts		
19	3/3	Electron counting – d-counts, valence counts	13.7		13.1-13.7, 13.10
20	3/6	Octahedral – 18 e rule and ligand field theory (AK Guest Lecture)	10.2-10.4	D&G 6	
21	3/8	More on ligand field theory (AK Guest Lecture)			
22	3/10	Quiz 4 – Ligand field theory (AK Guest Lecture)			

23	3/20	Square planar and tetrahedral coordination			
24	3/22	Catchup and review			
EXAM	3/24	EXAM 2 Coverage (Ch 4 and 5), 5.4, 13.1-13.2, 10.2-10.4			
25	3/27	Spectrochemical series, more high and low spin	10.1, 10.4-10.7		
26	3/29	Magnetic moments, Jahn-Teller distortions			
27	3/31	Quiz 5 – Advanced ligand field theory			
28	4/3	Electronic Spectra – beers law, selection rules (MR Guest Lecture)	11		H&B 5
29	4/5	Electronic spectra (MR Guest Lecture)			
30	4/7	Electronic spectra (MR Guest Lecture)			
31	4/10	IR spectroscopy again (backbonding, etc)			
32	4/12	MLCTs, LMCTs, MMCTs			
33	4/14	Quiz 6 – Electronic spectra	12		
34	4/17	Ligand substitution rxns, trans effect, etc.			
35	4/19	Catchup and review			
EXAM	4/21	EXAM 3 – Coverage 10.1, 10.4-10.7, 11, 12			
36	4/24	HSAB Theory, chelate effect, etc.			
37	4/26	Special topics: Organometallics			
38	4/28	Special topics: Bioinorganic			
39	5/1	Special topics: Energy & Semiconductors			
40	5/3	Special topics			
41	5/5	Special topics			
FINAL	5/9	Coverage: COMPREHENSIVE!			