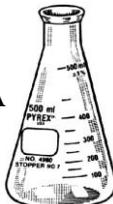


SYLLABUS
Chemistry 312
Spring, 2022

INORGANIC CHEMISTRY

Instructor: Robert D. Pike
Integrated Science Center 1039A
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Office Hours:
Monday 9:00–10:30 am (*Zoom*)
Thursday 1:30–3:00 pm (in-person)
(and by appointment)

Course Goals and Rationale: In this course we will reinforce and extend concepts first introduced in general chemistry and will explore bonding and reactivity in inorganic chemistry, including solid state structures, the chemistry of the elements, and introductions to symmetry and organometallic chemistry. The course is primarily intended for chemistry majors and minors.

Text: G. L. Miessler, P. J. Fischer, and D. A. Tarr, *Inorganic Chemistry*, 5th ed.; Prentice Hall: Upper Saddle River, NJ, ISBN 978-0321811059 (2014).

Lectures: Monday, Wednesday, Friday, 12:00–12:50 pm, Small Hall 111. *All students and the instructor will wear masks during class. Eating and drinking in class is not allowed.* All lectures are recorded and posted to *Blackboard*.

Registration deadlines: Add/drop deadline: Friday Feb. 4. Withdraw deadline: Monday March 28.

Mid-Term Examinations: (20% for each of the higher scores, 10% for the lowest score)
Dates: March 2, April 1, April 27

All the material on exams relates to the course lectures/slides. The textbook is intended to supplement and amplify this material. All exams will be graded in and returned to the student through *Gradescope*. Please let me know ASAP if you have accommodations from the SAS office.

Make-up tests are not typically permitted. If you must miss an exam, please let me know at least one week in advance so that we can arrange for you to take the exam early.

Final Examination: (30%) In-class, closed-book, cumulative. May 10, 9:00 am–12:00 pm

Practice Exams and Review Sessions: Practice exams will be provided for each mid-term exam via *Blackboard*. A review session will be scheduled before each exam.

Problem Sets: (10%) Made available via hand-out and through *Blackboard*. Handed in either by hard copy or by uploaded scan in *Gradescope*. All problem sets will be graded in and returned to the student through *Gradescope*.

Practice Problems: Assigned from the text, not handed-in/graded.

Project: (10%) Can be done individually or in groups of 2 or 3 students. You will put together a *PowerPoint* show (10–15 slides) on a topic of your choosing related to the wonders of chemistry. I will provide a list of some possible topics, but please feel free to suggest your own topic. All topic choices must be cleared with me. The final *PowerPoint* project will be submitted to me via email, and will be posted to our *Blackboard* site where you will have the opportunity to learn from, and help grade, each other's projects.

Class Discussion Forum: Rather than emailing questions to me, I encourage you to post your questions to our *Piazza* discussion forum, which will enable you to get help quickly and efficiently from me and from your classmates. When you are posting questions on the course material, do so publicly so that other students can benefit from the questions & answers. For personal matters, you should post to me privately. I will use *Piazza* for all course announcements. I will enroll all students into our class *Piazza* forum. Here is the web address for our class *Piazza* site: <https://piazza.com/wm/spring2022/chem312/home>

Student Accessibility Services: William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please see www.wm.edu/sas. Students are responsible for adhering to their SAS-approved time limits on assessments.

Diversity & Inclusion Vision Statement: William & Mary values and actively nurtures an environment of diversity and inclusiveness where every individual is embraced, respected, and afforded the same opportunity to grow, to succeed, and to contribute to William & Mary's success.

Honor Code: All students are expected to follow the William & Mary Honor Code.

"As a member of the William & Mary community, I pledge on my honor not to lie, cheat, or steal, either in my academic or personal life. I understand that such acts violate the Honor Code and undermine the community of trust, of which we are all stewards."

For more information on the Honor Code, please see:

<https://www.wm.edu/offices/deanofstudents/services/communityvalues/honorcodeandcouncils/honorcode/index.php>

COVID-19 Information: This semester, the world will enter its third year with COVID. As we experience a fifth surge of pandemic with the highly transmissible omicron variant, it is reasonable to expect significant levels of infection at W&M. As an academic community based on faculty and students *convening*, spring 2022 courses will largely consist of in-person instruction. All of us will follow W&M requirements - vaccinations and boosters, indoor masking, as well as quarantine and isolation when ill. That last is really important: for those who have tested positive, W&M's requirements must be fulfilled before class can be attended in person, and, out of an abundance of caution, anyone with symptoms consistent with COVID- even if they don't have a positive test- should not come to class.

Please note that testing positive for COVID or any other temporary illness is not considered a disability as defined by ADA guidelines and is not under the purview of W&M's Student Accessibility Services. Thus, any questions should be addressed via email to the instructor.

For this course in fall, 2022, here is the way that we will address **student absences:** *If you are not feeling well on a given day, please do not come to class.* If you miss class due to illness or isolation, let me know privately on *Piazza* or by email. Since all lectures are recorded and promptly posted to *Blackboard*, you will not have to miss any material. If you have a close contact with someone who is sick, so long as you are fully vaccinated and boosted, you do not

have to isolate, so long as you're asymptomatic. But if you test positive or show symptoms, you should not come to class. If illness or isolation causes you to fall behind, let me know and we'll work out a schedule for handing in problem sets late and possibly taking an exam late.

Here is the way we will address **instructor absence**: If I am sick or isolating, I'll transition any lectures to *Zoom* on a temporary basis. We'll move back to in-person lectures as soon as I am well and cleared to return to campus.

I know that the pandemic has taken its toll on everyone. If you find yourself struggling with the workload or material this semester, please talk to me, and I'll do my best to help. I'm glad to talk to you any time and not just about course-related items. Join me in my *Zoom* and/or in-person office hours just to say "Hi" if you'd like.

Course Topics, Lecture Dates, Reading Assignments & Practice Problems:

Topic	Lecture Dates	Practice Problems in Miessler (optional)
I. Bonding (2, 3, 6) Orbitals and the periodic table Covalent bonding: localized picture Covalent bonding: molecular orbitals Lewis acids & bases, hard/soft principle	1/26, 1/28, 1/31, 2/2, 2/4, 2/7, 2/9	2:15, 16, 17, 22, 23, 26, 27, 28, 29, 30, 33, 34, 35, 38, 42, 43, 3:1, 3, 5, 8, 10, 17, 20, 41, 6:1, 25
II. Structure (7) States, phases and inter-particle forces Closest packing and metals Conduction and semi-conduction Ionic structures Defect structures	2/11, 2/14, 2/16, 2/18, 2/21, 2/23	7:2, 4, 5, 6, 7, 8, 9, 10, 12, 14, 21, 33
<i>EXAM 1 Covers units I & II</i>	3/2	
III. Main Group Chemistry (8) Hydrogen Groups 1 and 2 Groups 13–17	2/25, 2/28, 3/4, 3/7, 3/9, 3/11, 3/21, 3/23, 3/25	8:1, 2, 20, 22, 24, 31, 32, 34, 36, 45
<i>EXAM 2 Covers unit III</i>	4/1	
IV. Symmetry (4) Symmetry operations and point groups Dipole moment, chirality, and chemical equivalence Space group symmetry and X-ray crystallography	3/28, 3/30, 4/4, 4/6, 4/8	4: 4, 5, 20, 22, 23, 25, 33, 34
V. Transition Metals (9, 10, 12) Oxidation states and ligands Coordination complexes Crystal field theory	4/11, 4/13, 4/15, 4/18, 4/20	9:3, 7, 8, 12, 13, 27, 10:1a-d, 3a,c,d, 8, 21, 12:1, 5
<i>EXAM 3 Covers units IV & V</i>	4/27	
VI. Organometallic Chemistry (13, 14) Metal carbonyls The 18-electron rule	4/22, 4/25, 4/29, 5/2, 5/4, 5/6	13:1, 2, 3, 4, 6, 13, 35a-c, 40, 43, 14:1a-e, 2a-d, 13, 20, 22, 23, 25

σ -Donor ligands π -Donor ligands 16-electron complexes, reactions, and catalysis		
FINAL EXAM 3 <i>Covers all units</i>	<i>5/10, 9:00–12:00 noon</i>	

