

Chemistry 3200 – Inorganic Chemistry

Spring 2021

Contact/Schedule Information

Dr. Dean Johnston, Science 325 Phone: 823-1489 (office)
MWF 11:30am – 12:25pm E-mail: djohnston@otterbein.edu
Science 238 Twitter: @dhjchem

Office Hours

I will be available for *online* office hours (the course Blackboard Collaborate room will be open) to discuss and answer questions on Mondays from 2:30 – 3:30pm and Wednesdays from 3:00 – 4:00pm. Individual or group online meetings at specific times can be arranged by contacting me via e-mail if the set times do not work with your schedule.

Our lives are complicated, especially now, and those complications can pile up during the semester. If you experience difficulties that affect your ability to succeed in this class and if I can help, I'm happy to listen, I'll work with you, and I can connect you with other resources.

Required Course Materials

- *Inorganic Chemistry, Fifth Edition*, by G. L. Miessler, P. J. Fischer and D. A. Tarr

Course Overview

This course will emphasize the fundamental concepts needed to understand the diverse chemistry of all the elements of the periodic table. The common theme for the entire course will be *Structure and Bonding*. The primary focus will be inorganic molecules, ions and solids, but the concepts we will discuss are applicable to all aspects of chemistry. The first two-thirds of the course will cover theories of bonding in molecules and solids along with some background in symmetry and structure. The remainder of the course will extend these concepts and apply them to the chemistry and properties of the transition metals and their complexes.

Catalog Description

Survey of the properties and reactivity of main group and transition metal elements. Topics include atomic structure and bonding theory, molecular orbital theory, acid-base theories, inorganic nomenclature, coordination chemistry, periodic properties of the elements, and basic organometallic and bioinorganic chemistry. Prerequisite: CHEM 1500 and 1510.

Course Structure and Expectations

HyFlex (hybrid-flexible) Model

As can be seen from the tentative course schedule, the pattern most weeks will be for half the class to meet in-person on Mondays (Group A), the other half on Wednesdays (Group B), with the full class online (via Blackboard Collaborate or other online meeting tool) most Fridays. My preference is for students to attend in person for their assigned in-person sessions. But I understand that circumstances may arise that make it difficult or impossible to attend in person.

For this reason, a *HyFlex* structure will be used, giving the option to join and participate online for all class sessions.

Attendance

Regular attendance (either in person or online) is expected of all students. However, if you are not feeling well and especially if you exhibit the signs we have asked you to look for in a daily self-assessment, you should not come to the in-person class session that day. What I will expect from you is that you catch up with the work, which could mean watching a recording of class discussion, or visiting me during my (virtual) office hours or another scheduled meeting time to stay connected to the course. But keep in mind that class recordings are not a substitute for attending class when you are able to.

Active participation is expected through prior reading of assigned material and through worksheets completed during class sessions. If you cannot join class at the scheduled time due to lack of access to private space or Internet connectivity, please let me know. In-person attendance is **required** at all exams.

COVID-19 Related Responsibilities

We are relying on our Cardinal Community to help us stay healthy and stay strong so we can stay together. To do so, we have created six main responsibilities for all members of the campus community this fall:

1. Perform a daily self-assessment. Don't come to campus if you have two or more of the following symptoms: fever, cough, shortness of breath, chills, repeated shaking with chills, muscle pain, headache, sore throat, new loss of taste or smell.
2. Wear facial coverings. Students, faculty, staff and visitors are required in common spaces and outdoors when social distancing is not possible.
3. Practice social distancing. Stay 6 feet from other people whenever possible.
4. Keep it clean. Clean your workspace or common spaces with the provided sanitizing supplies.
5. Practice good hygiene. Wash your hands frequently for at least 20 seconds.
6. Share concerns via anonymous reporting page. If you have concerns or suggestions, you can report them anonymously through the reporting page on Ozone – Return to Campus tab

Common symptoms of COVID-19 include a fever of 100 degrees or higher, new cough and shortness of breath, chills, repeated shaking with chills, muscle pain, headache, sore throat, and new loss of taste or smell. If you have two or more of these symptoms, follow the steps below:

- Do not attend your classes, leave your room or come to campus.
- Contact the COVID Support Line if you have symptoms and/or test positive for COVID-19 by calling 614-823-1586.
- Leave a message on the office voicemail with your name, student ID number, and phone number for a call back within 24 hours.
- You will be prompted to answer questions related to symptoms and current living situation.
- *If your symptoms are serious and need immediate attention, call 911.*
- A team of Student Affairs staff will contact you with information about next steps for medical assistance, testing, and possible isolation or quarantine.

Homework

Homework Assignments

Homework problems will be assigned regularly (see Weekly Schedule) but will **not** be collected or assessed for points. The goal of assigning homework is to involve you in the material. Many of the concepts in chemistry are best learned by working through problems that test your skills and comprehension. It is fully expected that class time will be spent going over and discussing homework problems.

Assessment: Exams

There will be four mid-term examinations and one comprehensive (American Chemical Society) standardized final examination. Exams are scheduled as outlined in the schedule below, but the times may change if needed.

Online Resources and Course Communication

Blackboard

Blackboard will be used to post class materials such as syllabi, some readings, web links and other supplementary information. I will also maintain a course grade book within Blackboard that will list scores. Scores will be entered periodically but may be out of date. I will try and post copies of any announcements as well.

E-mail

Announcements and Reminders - Announcements and reminders will be sent by group e-mail to official Otterbein e-mail accounts. Please use your Otterbein e-mail account when emailing me about class.

Twitter @dhjchem

Twitter will be used for potentially interesting information related (or unrelated) to the class.

Academic Integrity (University Policy on Academic Integrity)

I fully expect every student to behave in an honest and ethical manner when it comes to work performed for this class. I expect and encourage students to work together when studying. Any material to be turned in for a grade, however, must represent the work of the individual.

As per the *University Policy on Academic Integrity*: All academic work should be your own. Academic dishonesty (plagiarism and cheating) may result in automatic failure of the assignment or the course itself, and you will be referred to the Academic Affairs Office for suspension or expulsion proceedings. You are plagiarizing when you:

- Copy material from a source without using quotation marks and proper citation.
- Paraphrase a source, substituting words and sentences but keeping its meaning and structure without citing the source.
- Lift phrases or terms from a source and embed them in your own prose without using quotation marks and proper citation.
- Borrow ideas (that are not common knowledge) from a source without proper citation.
- Turn in a paper wholly or partially written by someone else.

Learning Differences

The University has a continuing commitment to providing reasonable accommodations for students with documented disabilities. Like so many things this year, the need for accommodations and the process for arranging them may be altered by the COVID-19 changes we are experiencing and the safety protocols currently in place. Students with disabilities who may need some accommodation in order to fully participate in this class are urged to contact Disability Services as soon as possible to explore what arrangements need to be made to assure access. During the Spring 2021 semester Disability Services can be reached by contacting Kera McClain Manley, Assistant Director of the ASC and Disability Services Coordinator, at kmanley@otterbein.edu.

English Language Learners (ELL)

If English is not your native language, please either speak with me after class or contact me by e-mail by Friday of the first week. Otterbein University and the Department of Chemistry have ELL resources that may help you in your studies.

Statement on Credit Hour Definition and Expectations of Student Work

For each credit hour of classroom or direct faculty instruction, students are expected to engage in two hours of out-of-class course-related work (readings, homework, studying, project preparation, etc.). A three credit hour course requires six hours per week of out-of-class work.

Grading

Grades will be based on your performance on the assignments, exams, etc., broken down approximately as follows:

		Letter	Percentage
		A	93 – 100%
		A-	90 – 92%
		B+	87 – 89%
		B	83 – 86%
		B-	80 – 82%
		C+	77 – 79%
		C	73 – 76%
		C-	70 – 72%
		D+	67 – 69%
		D	60 – 66%
		F	< 60%
Midterm Exams (4 x ~ 75 pts)	300 pts		
Final Exam	100 pts		
Other assignments	50 pts		
Participation and in-class activities	50 pts		
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Total	500 pts		

Course Schedule

The *tentative* course schedule is listed below, highlighting chapter sections, topics, scheduled exams, class format (in-person versus online) and other important dates.

Wk	Date	Section(s)	Description	Format
1	01/18		<i>No class - MLK Day</i>	
	01/20	Ch. 1, 2.1	What is Inorganic Chemistry, the Bohr equation	online
	01/22	2.2	Hydrogenic orbitals, radial distributions	online
2	01/25	2.2	Angular distributions, electronic configuration	A in-person
	01/27	2.3	Effective nuclear charge, periodic trends	B in-person
	01/29	3.1	Localized bonding: Lewis dot structures	online
3	02/01	3.2	Localized bonding: VSEPR, hybridization	A in-person
	02/03	3.3 – 3.4	Electronegativity, polarity, hydrogen bonding	B in-person
	02/05	review	Review for Exam #1	online
4	02/08	Ch. 2 – 3	Exam #1	all in-person
	02/10	4.1	Molecular symmetry, symmetry operations	A in-person
	02/12	4.2, 4.3	Symmetry point groups and their properties	online
5	02/15	4.4	Examples and applications of symmetry	A in-person
	02/17	5.1	Construction of molecular orbitals	B in-person
	02/19	5.2	Molecular orbitals for homonuclear diatomics	online
6	02/22	5.3	Heteronuclear diatomic molecules	A in-person
	02/24	5.4	Constructing ligand group orbitals (LGOs) and	B in-person
	02/26	5.4	molecular orbitals for larger molecules	online
7	03/01	review	Review for Exam #2	online
	03/03	Ch. 4 – 5	Exam #2	all in-person
	03/05	6.1 – 6.3	Acid-Base interactions and acid-base definitions	B in-person
8	03/08	6.4	Lewis Acid-Base, strengths of acids and bases	A in-person
	03/10		<i>Reading Day - no classes</i>	
	03/12	6.5 – 6.6	Intermolecular forces and HSAB theory	B in-person
9	03/15	7.1	Ionic solids, geometries of crystal lattices	A in-person
	03/17	7.2	Close packed structures, lattice energies, ionic radii	B in-person
	03/19	7.3	Band structures, structures of silicates	online
10	03/22	review	Review for Exam #3	online
	03/24	Ch. 6 – 7	Exam #3	all in-person
	03/26	9.1	Introduction to coordination chemistry	B in-person
11	03/29	9.2	Coordination chemistry – nomenclature	A in-person
	03/31	9.3	Coordination chemistry – isomerism	B in-person
	04/02	9.4 – 9.5	Coordination complex structures, frameworks	online
12	04/05	10.1	Spectroscopic / magnetic properties of TM complexes	A in-person
	04/07	10.2	Crystal Field Theory	B in-person
	04/09	10.3 – 10.4	Ligand Field Theory, the spectrochemical series	online
13	04/12	10.5 – 10.6	Jahn-Teller effect, geometrical preferences	A in-person
	04/14	review	Review for Exam #4	online
	04/16	Ch. 8 – 9	Exam #4	all in-person
14	04/19	12.1 – 12.2	Reactivity of coordination compounds	A in-person
	04/21	12.3 – 12.4	Substitution reactions in metal complexes	B in-person
	04/23	review		online
15	04/26	Final Exam	Final Exam - Monday, April 26, 10:15am - 12:15pm	all in-person