Course Syllabus

CHEM 3010 Syllabus

Course Information

CHEM 3010 | *Spring 2025* | *Hybrid (in-class lectures & online content)*

Monday and Wednesday at 12:05pm-12:55pm | 2205 Gilman Hall

Department: Chemistry

Credit Hours: 2

Course Prerequisites: *CHEM 3240 (co-requisite with instructor permission)*

This course examines atomic and molecular structure, structure and chemical bonding principles, molecular shapes and symmetry, acids and bases, redox reactions, and solid state structure.

Instructor Information

Name: Cristina Bonaccorsi

Email: cbonacco@iastate.edu

Phone: email preferred

Office Address: 2754 Gilman Hall

Student (Office) Hours: Monday & Wednesday at 11am in 2754 Gilman Hall. These times are subject to change.

Course Learning Outcomes

1. By completing this course, students will be able to **explain** atomic structure using quantum mechanics and **examine** and **justify** periodic trends and atomic properties in particular of the main groups' elements (e.g., atomic radius, ionization energy, electronegativity, reactivity).
2. By completing this course, students will be able to **apply** fundamental bonding models, including Lewis structures, VSEPR theory, valence bond theory, and molecular orbital theory, to **predict** the structures and bonding properties of simple inorganic molecules, and to

evaluate bond length, bond strength, and bond enthalpy.

3. By completing this course, students will be able to **identify** symmetry elements in molecules and **apply** group theory to **predict** molecular symmetry, laying the foundation for applications in spectroscopy.
4. By completing this course, students will be able to **describe** and **explain** acid-base and redox reactions, using the Lewis and Brønsted-Lowry acid-base theories, oxidation states, and balancing techniques for inorganic reactions.
5. By completing this course, students will be able to **describe** and **compare** basic crystal lattice types, **evaluate** lattice energies, and **analyze** the electronic structure of solids to **predict** their physical properties such as conductivity.

Course Materials

Textbook

Inorganic Chemistry, 7th Ed., Weller, Overton, Rourke, Armstrong, 2018. This is an eBook. **(https://canvas.iastate.edu/courses/114875/pages/required-textbook-immediate-access-one)**

Required Textbook, Immediate Access ONE (https://canvas.iastate.edu/courses/114875/pages/required-textbook-immediate-access-one)

Provided to you via the **Immediate Access ONE (https://www.isubookstore.com/immediate-access-one-students)** program.

Top Hat

Top Hat is available to all Iowa State faculty, staff, and students, with no need to purchase an individual license. See the Top Hat section below in Learning Activities and Assessments.

Scientific Calculator

A scientific calculator with basic functions including logarithms and exponential functions. The use of scientific/graphing calculators is permitted during tests (quizzes and exams), but students must not use the calculator for purposes other than calculations during the test (for example, do not store formulas and other information pertaining to the chemistry content on the device). Proctors reserve the right to inspect and confiscate the calculator. Spare calculators are provided during exams.

Card-stock Periodic Table

During the first week of class, you will be issued a periodic table on card-stock. This periodic table is yours to use throughout the semester and during exams. You may add notes to the periodic table with one rule: it must be written in **non-erasable ink** (pen, marker). Instructors and TAs will make spot checks of these periodic tables throughout the semester. If you lose your periodic table, you will not receive a replacement. Each exam will contain a formula sheet with a periodic table and relevant equations, so losing the card stock version will only mean you lose access to your notes. So, don't lose your periodic table. ***Producing a replacement periodic table to subvert this rule constitutes academic misconduct.***

Course Technologies

1. A reliable Internet connection.
2. Access to Iowa State University computer system and your Learning Management System (Canvas etc.).
3. An internet-ready device for in-class quizzes (Top Hat).
4. Access to a computer with a microphone and audio capability.

Learning Activities & Assessments

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Lectures

You are expected to **attend regularly** and to read the available material (text-book and lecture notes) before lecture. Not everything in the assigned readings will be covered in lecture.

Team Activities

Team activities will be performed in addition to the classic lecture set-up; tentatively, there will be one in-class team activity at the end of each chapter (tentatively, one class period every other week). Teams will be created by the instructor and are going to be permanent during the entire semester. Each team-based class period is characterized by 3 phases:

Phase 1: Preparation

You will complete readings from the textbook and lecture notes and work on the suggested end of chapter problems and homework problems ***on your own time prior to the class period***. This phase is not graded *per se*.

Phase 2: Readiness Assurance Tests (RATs)

At the beginning of the class meeting, you will be given a **Readiness Assurance Test** (RAT). The RAT test measures your comprehension of the assigned readings and helps you learn the material needed to begin problem solving in phase 3. The purpose of phase 2 is to ensure that you and your teammates have sufficient foundational knowledge to apply and use the course concepts in phase 3. **RATs are closed book tests.**

- **Individual RAT (iRAT)** – You individually complete a 2-5 question multiple-choice test (Top Hat).
- **Team RAT (tRAT)** - Following the iRAT, the same multiple-choice test is re-taken with your team (Top Hat or other polling methodology). You negotiate with your teammates, and then answer. Immediate feedback is given after each tRAT.
- **Feedback and Mini-lecture** - Following the RATs, if needed the instructor provides a short clarifying lecture on any difficult or troublesome concepts.

Phase 3: Application Exercises

You and your team use the foundational knowledge acquired in the first two phases to make decisions that will be reported publicly and subject to cross-team discussion/critique. Typically this activity includes a worksheet that you complete as a team and turn in at the end of the class period.

Grading

We will use a variety of methods to have you report your and your team's decision at the end of each activity (Top Hat, on paper). The scoring of each individual part will depend on the topic. Clear information will be provided in class.

TBL total scores are out of 10 points and will be calculated by adding the various component as shown in the table below.

Activity	Weight
iRAT	20%
tRAT	25%
Application Excercise	50%
Participation	5%
Total	100%

Table 1. How each activity contributes to the total score. The percentages will be use to calculate the score of up to 10 points.

This teaching strategy is a modified version of team-based learning (**www.teambasedlearning.org (http://www.teambasedlearning.org)**). Additional information will be provided in class.

- individual tests (iRAT), team tests (tRAT), and application exercises are part of the team-based portion of the grade. Each team member is expected to participate actively to the teamwork and the instructor will assess each team member's participation. **A student who is not participating to the activities will not receive credit.** Participation is assessed by the instructor and the teaching assistant.
- **there will be 6 team activities assignments worth 10 points each**
- **the top 5 scores will count towards your final grade; in essence, 1 lowest score will be dropped, including one zero due to absence**
- **the team activities percentage weights 20% towards your final grade**

Top Hat

Click the **Top Hat 1.3** link in our Canvas course navigation menu to join the Top Hat course.

Top Hat is an in-class engagement tool that I will be using during the team-based activities.

iRATs and tRATs are submitted and graded via Top Hat.

Visit the **Top Hat learning tool guide (https://www.celt.iastate.edu/learning-teaching-technology/top-hat/)** (*scroll down to Student Resources*) to view the terms of service, privacy policy, accessibility statement, and **instructions for joining the Top Hat course** and engaging with the Top Hat course.

- **Top Hat is graded - see Team Activities**

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in-app support button, or by calling 1-888-663-5491.

Properly connecting to Top Hat

- Close other apps
- Download Top Hat before or after, not during class
- Have only one device connected to Wi-Fi at a time
- Use “offline mode” on mobile apps if Wi-Fi or cellular signal is weak
- Use the text/SMS option (data charges may apply)
- Make sure your device is fully charged
- In some classrooms, the cellular signal is very weak; **Wi-Fi** is your best option; choose **IASTATE**
- **Turn the Wi-Fi off and on again!!!**

Homework

Homework assignments are assigned by chapter; each assignment will be due at the start of the lecture period following the completion of the corresponding chapter. No late assignments will be accepted without an approved advanced notice. Each assignment will be posted on Canvas: **you must print the document and turn it in with your homework as the cover sheet**. Please write legibly. You are encouraged to work with other students on the homework, but you must turn in your own individual set of solutions. Solutions will be posted on Canvas after the due date.

- **there will be 6 homework assignments worth 10 points each**
- **the top 5 scores will count towards your final grade; in essence, 1 lowest score will be dropped, including one zero due to missed submission**
- **the Homework percentage weights 20% towards your final grade**

Exams

There will be 3 hour-exams on **Monday February 24, Monday March 31, and Wednesday April 30** during class time. Location will be announced in class and on Canvas. Add these dates and times to your planner. Students are given instructions on how to seat in the classroom during the exam. Proctors are permitted by the instructors to request that students move to the seats in the front of the classroom at any time during the exam. This will not affect the exam score in any ways; however, should a student refuse to change seats, the instructor will be notified. **If you have a valid, serious reason to miss an hour exam, you need to immediately contact the instructor**. You will be asked to drop the course if you miss more than one exam. Your graded hour exams will be returned in class. Any request for a re-grade must be clearly given in writing on the back of the exam before leaving the class. Information specific to each exam will be communicated via email and on Canvas.

Read and review the information and instructions in the link below BEFORE each exam!

Exam Information and Instructions (https://canvas.iastate.edu/courses/114875/pages/exams-information-and-instructions)

- **the hour-exams total percentage weights 40% towards your final grade**
- **no drops**

Final Exam

Final examinations will be held on **Monday May 12 at 12pm-2pm**. More information about the CHEM 3010 final exam will be announced in person in class and through Canvas. Do not schedule any travel until you have all your final exam dates confirmed. Alternative final exam times will only be scheduled for students with a conflicting final exam time or those with three or more finals scheduled for the same day. There will be no exceptions. The last day to request an alternative time for the final exam is Friday DATE. The university **final examinations policy (https://www.registrar.iastate.edu/students/exams)** will be followed strictly. Our final exam will be a 2-hour, comprehensive exam.

- **the final exam percentage weights 20% towards your final grade**
- **the final exam percentage may "replace" the percentage of ONE lowest hour-exam**
- **the final exam percentage is firm (no drops/replacements)**

Grading

Grade Distribution

Your grade in this course includes the following participation areas:

Course Component	Percentage
Homework Assignments	20%
Team-Based Activities	20%
Exams	40%
Final Exam	20%
Total	100%

Table 1. Grade Distribution

Grading Scheme

The following grading scheme will be used to assign a letter grade:

Grade	Range
A	93% to 100%
A-	90% to < 93%
B+	87% to < 90%
B	83% to < 87%
B-	80% to < 83%
C+	77% to < 80%
C	73% to < 77%
C-	70% to < 73%
D+	67% to < 70%
D	63% to < 67%
D-	60% to < 63%
F	0% to < 60%

Table 2. Grading Scheme

Final grades are based solely on graded work and are NOT negotiable; **no single student will be offered make-up assignments, retakes, or extra credit points**.

Course Policies

Late or Missing Assignments

Homework assignments and team activities are designed to help you master a topic before an exam and before we move on to the next topic; thus, **you must complete the work by the scheduled deadline**.

The grading policies outlined for homework assignments and team activities give some flexibility for you to miss a lecture or a deadline without hurting your overall grade. These policies are designed to allow for absences or missed assignments due to illness, emergency, or other unavoidable conflict. Please contact me if you would like to discuss your absence. You must contact me as soon as possible, see next section.

Deadline Extensions

Deadlines are firm. This said, communication is important: if you know you will be unable to complete an assignment because of illness or another emergency, contact me in advance. If the illness or other emergency happens on the day the assignment is due, you must contact me as soon as possible.

Missing an exam will affect your grade significantly: if you have a valid, serious reason to miss an exam, you need to **immediately** contact me. You will be asked to drop the course if you miss more than one exam.

Accessibility

Visit the link under University Policies below for the official University accessibility statement.

Additionally, carefully read **Academic Accommodations (https://canvas.iastate.edu/courses/114875/pages/academic-accommodations)** for more information on how to implement

academic accommodations in this course, especially how to take our exams at the Exam Accommodation Center.

Expected online and classroom behavior

- All communication within the course should adhere to university standards of **Netiquette at ISU (https://iastate.app.box.com/v/isu-netiquette)**. Specifically, communication should be scholarly, respectful, professional, and polite.
- You are expected to follow **ISU's Principles of Community (https://www.diversity.iastate.edu/connect/principles)**.
- You may disagree with other students, but such disagreements need to be based upon facts and documentation. It is my goal to promote an atmosphere of mutual respect in our interactions. Please contact me if you have suggestions for improving the interactions in this course.
- Professional and respectful tone and civility are used in communicating with fellow learners and the instructor, whether the communication is by electronic means or by phone or face-to-face.
- Video interactions reflect a respectful tone in verbal communications and body language.
- Use correct spelling and grammar.

Ground rules for exams

You must work independently.

You are permitted use the following authorized resources to complete the exams:

- Scientific or graphing calculator.
- Paper and pens/pencils (any work on scratch paper will not be graded.)
- The issued card-stock periodic table.

You are NOT permitted to do the following:

- You may NOT communicate with anyone else about the exam.
- You may NOT have anything else but the items mentioned above on your desk.
- You may NOT use any electronic devices (except for a calculator) and notes/textbooks.
- You may not use any other resources but your mind!

We actively monitor for illicit behavior.

Ground rules for homework assignments

You are permitted use the following authorized resources:

- Scientific or graphing calculator, Excel (for calculations.)
- Paper and pens/pencils (any work on scratch paper will not be graded.)
- Your course notes and book.
- CHEM 3010 Canvas course content and any links to external webpages that are provided therein.
- You may post questions about homework on the Help Forum and/or ask me; you will not receive a direct answer (e.g. the solution to the problem) but you will be advised on how to proceed in the solution.
- Group work is encouraged at this stage in your learning, but you must also practice solving independently.

You are NOT permitted to do the following:

- You may NOT have someone else solve the questions for you.
- You may NOT post and/or consult unauthorized aids, including paid-for subscriptions to Chegg, Scribd, or tutoring services.
- You may NOT search the questions in a search engine (e.g. Google).

Scores

All assessments (except iRATs and tRATs) are graded manually and the scores posted on Canvas within one week. Errors may occur: if you believe that an error occurred, you must inform me immediately, and by one week after the assignment due date. It is the student's responsibility to check grades on Canvas.

Final Grades

Final grades are based solely on graded work and are NOT negotiable; **no single student will be offered make-up assignments, retakes, or extra credit points**.

Conflict resolution

If you have questions or concerns about our course policies and/or if you have a problem in class, this is the recommended course of action: you should promptly write an email or speak in person detailing your concerns to your instructor; if a resolution cannot be reached, the professor will refer you to the proper channels for **filing a complaint (https://**

www.complaints.iastate.edu/) .

Many issues can be resolved if a student makes an appointment with a faculty or staff member and communicates their concerns in person.

Academic dishonesty course-specific information

In addition to the general guidelines found in the University Policies, the following constitutes academic misconduct: copying or sharing answers on tests or assignments, consulting unauthorized resources during tests or assignments (e.g., phone, tablet, computer, notes, book, etc.), not following the guidelines regarding the card-stock periodic table, having someone else do your academic work, altering graded work prior to submitting for a regrade request.

University Policies

Visit the Syllabus Statements page for the official list of University Policies.

ISU Syllabus Statements (https://celt.iastate.edu/prepare-and-teach/design-your-course/syllabus-statements/)

Canvas Technical Assistance

- Receive 24/7 support from Canvas live chat by clicking the ⓘ Help option on the Canvas global navigation to your left and opting to chat with Canvas support.
- Call the 24/7 Canvas support phone line by dialing 515-294-4000 and following the prompts for Canvas support.
- Explore the self-paced **Canvas Student Orientation course (https://canvas.iastate.edu/courses/104973)** to understand standard Canvas functions.

How to find help!

Start Here (https://canvas.iastate.edu/courses/114875/modules/851260)

Support and Resources (https://canvas.iastate.edu/courses/114875/pages/support-and-resources-2)

Contact (https://canvas.iastate.edu/courses/114875/pages/contact)

Disclaimer: In extenuating circumstances, the schedule, policies, or procedures are subject to change. All efforts will be made not to alter assignment due dates or scheduled exams. Any modifications will be communicated in writing, verbally in class, and/or published in the Canvas course.

Course Schedule

Printing This Page

Print or save this page by pressing Control+P (PC) or Command+P (Mac), and select a printer, or opt to Save as PDF.

The **deadlines** for exams **are firm**.

The **schedule** is **tentative** concerning the **content** of covered during each class and therefore on the exams. More information will be provided verbally in class and via Canvas Announcements throughout the semester.

Chapter	Learning Activities	Assessments and Due Dates
Chapter 1: Atomic Structure	By Monday, February 3 Go to class (estimated 3 lecture periods) Read Chapter 1 Prepare for Team-Based Learning: TBL-1 (1 lecture period)	By Monday, February 3 (1) Complete and Submit Homework Chapter 1. (2) Participate in TBL-1
Chapter 2: Molecular Structure and Bonding	By Wednesday, February 19 Go to class (estimated 4 lecture periods) Read Chapter 2 Prepare for Team-Based Learning: TBL-2 (1 lecture period)	By Wednesday, February 19 (1) Complete and Submit Homework Chapter 2. (2) Participate in TBL-2

Chapter	Learning Activities	Assessments and Due Dates
EXAM 1 Monday February 24 - Chapters 1 & 2		
Chapter 3: Molecular Symmetry	By Wednesday March 25 Go to class (estimated 6 lecture periods) Read Chapter 3 Prepare for Team-Based Learning: TBL-3 (1 or 2 lecture periods)* *exact dates will be communicated in class and via Canvas announcements!	By Wednesday March 25 (1) Complete and Submit Homework Chapter 3 Set 1 (due date tentatively on March 5)* (2) Complete and Submit Homework Chapter 3 Set 2 (3) Participate in TBL-3 (1 or 2 sessions)*
EXAM 2 Monday March 31 - Chapter 3		
Chapter 5: Acids and Bases	By Wednesday April 16 Go to class (estimated 4 lecture periods) Read Chapter 5 Prepare for Team-Based Learning: TBL-5 (1 lecture period)	By Wednesday April 16 (1) Complete and Submit Homework Chapter 5 (2) Participate in TBL-5
Chapter 4: The Structures of	By Monday April 28	By Monday April 28

Chapter	Learning Activities	Assessments and Due Dates
Simple Solids	Go to class (estimated 2 lecture periods) Read Chapter 4 Prepare for Team-Based Learning: TBL-4 (1 lecture period)	(1) Complete and Submit Homework Chapter 4 (2) Participate in TBL-4

EXAM 3

Wednesday April 30 - Chapters 4 & 5

Chapter 6: Oxidation and Reduction	By Wednesday May 7 Go to class (estimated 2 class periods) Read Chapter 6	By Wednesday May 7 (1) No homework due for this chapter

FINAL EXAM

May 12 at 12pm-2pm - Chapters 1-6

More information will be provided through Canvas and in class.

Do not plan for travel until the date of all your final exam is confirmed.