

Instructor: Dr. Joe Burnett
Office: 1608 Gilman Hall
Phone: 515/294-7815
Section 1: MWF 8:50 – 9:40 am, Gilman 2109
Office Hours: R 4-6 pm, F 10-11 am, and by appointment
Office hour location: 1101 Gilman
E-mail: joechem@iastate.edu
Pronouns: He/Him/His

Teaching Assistant: Filipa Monteiro
Office hour location: 1101 Gilman
Office Hours: W 3-4 pm & R 2-4 pm
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Vysakh Ramachandran
 1101 Gilman
 R 12 noon-2 pm
vysakhr@iastate.edu
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Course Description/Learning Outcomes: In Chem 3240 you will learn how quantum mechanics describes features of nature that classical mechanics cannot by using mathematical and conceptual tools. In addition, you will learn how quantization of energy is manifested in real-world situations, especially spectroscopy and molecular bonding. By the end of the course, you should have a firm grasp on these concepts and how they apply to the world around you. You are responsible for learning, understanding, and applying all subjects and concepts listed in this syllabus and presented throughout the course. Prerequisites for Chem 3240 include Chem 1670 or 1780, Math 1660, and Phys 2320. Chemistry 3240 is a 3-credit course. (**Attendance is highly recommended; attendance quizzes and in-class activities represent a portion of the overall grade**).

Required Materials: This course is enrolled in the Iowa State University Immediate Access ONE Program – see the last page of the syllabus for information about the program.

- **Textbook: Quantum Chemistry, Second Edition** – McQuarrie, University Science Books, 2008. (ISBN: 9781891389504)
- **Scientific Calculator** (with the functions: $\ln(x)$, e^x , 10^x , y^x) is essential. Graphing calculators are permitted.

Legal Cheat-sheet: (AKA Quick Reference Card) You will be provided with a card-stock legal cheat sheet for use on all exams and quizzes. You may write anything on the document with one rule - **it must be handwritten in non-erasable INK**. You may use both sides of the page. Instructors & your TA may make spot checks throughout the semester. If you lose your cheat sheet, you will NOT receive a replacement; however, each exam will contain a periodic table and all needed data, equations, and constants, so losing the card stock version will only mean you lose access to your notes. Producing a replacement or using pencil or erasable ink to subvert these rules constitutes academic misconduct. **All needed equations and constants and data will be provided on all of the exams.**

Office Hours: all TA and instructor office hours are held in 1101 Gilman.

Wednesday	3 – 4 pm	Filipa
Thursday	12 noon – 2 pm	Vysakh
Thursday	2 – 4 pm	Filipa
Thursday	4 – 6 pm	Joe
Friday	10 – 11 am	Joe

Grading Policies

Attendance (5%): In-class assessments using Top Hat are part of the grade for the course. Top Hat exercises make up 5% of the final grade. At the end of the semester, a minimum of the lowest 5 Top Hat scores will be dropped. This policy gives students the flexibility to miss up to five classes without impacting their overall grade.

Homework Quizzes (5%): There will be 15 homework quizzes over the course of the semester – one each week. Generally, there is no partial credit for these questions. Homework quizzes account for 5% of the grade at the end of the semester. At the end of the semester, the three lowest homework quiz scores will be dropped (the 12 top scores count towards the final grade). Homework quizzes are due Fridays at 5 pm.

Problem Sets (10%): Problem sets are handwritten (or typed) solutions to questions that are submitted on Canvas as a CLEAN and CLEAR PDF. (iPhones have a camera to pdf converter – visit the following link for instructions: <https://support.apple.com/en-us/HT210336>). On Android phones, several free apps are available on GooglePlay (Adobe Scan and Simple Scanner work easily and well). Parks Library, most public libraries, and various campus copiers have photocopiers with scanning capabilities.

Grading of problem sets: Each question on a problem set will get a score of 0 (no reasonable attempt), 1 (reasonable attempt, but not correct), or 2 (fully correct) plus **1 point for explaining the significance of the homework question or problem (why**

do you think that you have been assigned the problem); so each problem is worth 3 points. Collaboration is encouraged; feel free to work with other students on the homework, but you must turn in your own individual set of solutions. Answers to problem sets will be posted after the class when the assignment is due. Problem sets account for 10% of the grade. At the end of the semester, the three lowest problem set scores will be dropped (the 12 top scores count towards the final grade).

The purpose of dropping the three low scores on homework quizzes and problem sets is to allow you to have 3 free passes for when you cannot turn in your homework on time. We encourage you to complete and turn in all homework sets, because it is a good way to learn and keep up with the material. Students who submit all 15 homework sets AND score better than 60% on all of them will have 5% added to their overall problem set score.

For **EVERY problem set**, the following problem is included as part of the assignment: *Create one problem including the solution that would be suitable for inclusion on an exam in this class. Every week the student(s) who write the “best” one or two questions will be awarded 1 extra credit point. Criteria for selection as “best:” 1) Relates the material to a real-world application, 2) Relates a calculation to underlying concepts, 3) Creativity and/or uniqueness, 4) Relevance to material, and 5) Suitability for inclusion on our exams (not too time-consuming, representative of material covered in class, conceptual content)*

Note: Illegible exams or problem sets will NOT be graded. Photo submissions of problem sets will not be graded (problem sets must be submitted as legible PDFs). All work must be presented reasonably, neatly, and logically; all work MUST be shown. A correct answer without supporting work will receive a score of 0. Solutions to problem sets MUST be listed in the order given on the assignment.

Exams (80%): There will be three one-hour exams (each worth 20% of the final grade) and a *comprehensive* final exam (20% of the final grade). Exam dates are listed below.

Exam 1 Wednesday Feb 26 (likely to cover Chapters 1 – 4, MathChapters A, B, & C)

Exam 2 Wednesday Apr 2 (likely to cover Chapters 5 – 7, MathChapters D, E, & F)

Exam 3 Wednesday Apr 30 (likely to cover Chapters 8 – 10, maybe 11 & 12)

Final Exam: Tuesday May 13 @ 7:30 AM (cumulative)

Make-up exams will be administered only in exceptional cases, which must be discussed with the instructor and which absolutely require documentation. **Students who miss an exam MUST contact the instructor as soon as they are aware that they will miss the exam.** In some cases, at the instructor’s discretion, in lieu of a make-up exam, the final grade may be comprised of the remaining requirements, each taking on a proportionally higher weighting. **All students (including graduating seniors) MUST take the final exam.**

All exams, including the final exam, will be retained by the course instructor. Students will have opportunities to view the graded exams.

Grading: The grades are determined as follows: 10% from problem sets, 5% from online homework quizzes, 5% from in-class Top Hat exercises and on-line self-assessments or survey quizzes on Canvas, 20% from each of the three one-hour exams and 20% from the final exam. Plus-minus grading will be used for the final grade. Grades are based upon straight percentages with the following scale. The instructor reserves the right to modify the grading scale. **Final grades are not negotiable.**

A	A–	B+	B	B–	C+	C	C–	D+	D	D–	F
>93.29	90.0– 93.29	86.7– 89.99	83.3– 86.69	80.0– 83.29	76.7– 79.99	73.3– 76.69	70.0– 73.29	66.7– 69.99	63.3– 66.69	60.0– 63.29	<60.0

General Policies

Regrades on exams or homework assignments: Students have a deadline of **2 weeks** following an exam or homework assignment to request a regrade. Regrade requests must be limited to the correction of errors in grading. After 2 weeks, scores are set.

Canvas: <https://canvas.iastate.edu/> Canvas will be used for posting of scores and grades and will be central to disseminate information (such as lecture notes and problem sets) and announcements for the class. It is the student’s responsibility to check posted grades for accuracy. Any student who discovers an error in a grade on Canvas **MUST** bring the graded work to the attention of a teaching assistant or the course instructor within 2 weeks of submission of the work.

ISU final examinations policy will be followed absolutely: <https://www.registrar.iastate.edu/students/exams>. Students who have three or more finals on the same calendar day may request to reschedule a final. The instructor of the course having the

smallest number of students is responsible for arranging an alternate examination time for the student unless make-up exam times are available in one of the other courses. 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 days as listed above (and with Chem 3240 as their smallest course). There will be no exceptions. **The deadline to request an alternative time for the final exam is 11 am on Friday May 2.**

Illness or emergencies: If you have a health issue or emergency that requires you to miss multiple classes, you are advised to contact the Office of Student Assistance (<https://cyclonesupport.iastate.edu/>) and your academic adviser to keep them informed of your situation. If you are ill on exam day you must send an email to the instructor joechem@iastate.edu. There is no need to notify the instructor if you need to miss a lecture; at the end of the semester, a minimum of 5 Top Hat/attendance quizzes will be dropped to give you flexibility to miss class from time to time.

Order of Events (tentative):

Introduction & Overview	MathCh E: Spherical Coordinates
Ch 1: The Dawn of the Quantum Theory	Ch 6: The Rigid Rotor and Rotational Spectroscopy
MathCh A: Complex Numbers	MathCh F: Determinants
Ch. 2: The Classical Wave Equation	Ch 7: The Hydrogen Atom
MathCh B: Probability & Statistics	MathCh G: Matrices
Ch 3: The Schrödinger Equation and a Particle in a Box	Ch 8: Approximation Methods
MathCh C: Vectors	MathCh H: Matrix Eigenvalue Problems
Ch 4: The Postulates and General Principles of Quantum Mechanics	Ch 9: Many Electron Atoms
MathCh D: Series and Limits	Ch 10: The Chemical Bond: One- and Two-Electron Molecules
Ch 5: The Harmonic Oscillator and Vibrational Spectroscopy	Ch 11: Qualitative Theory of Chemical Bonding

Important Dates in the Semester

Jan 27:	Last day to drop a course and not appear on permanent record. Last day to change schedules using WorkDay.
Feb 3:	Last day to audit a course. An audit does not count towards full-time student status
Feb 26:	Exam 1
Feb 26-Mar 8:	Mid-term evaluations administered on Class Climate
Mar 8:	2:15 pm – interim grades due to Registrar (C-, D, F grades are reported)
Mar 17-21:	Spring Break (no classes)
Apr 1:	1,000,000 mid-term exam on Tuesday April 1st.
Apr 2:	Exam 2
Apr 4:	Last day to drop a course or withdraw without extenuating circumstances
Apr 28-May 9:	End of semester course evaluations administered on Class Climate
Apr 30:	Exam 3
May 2:	Last day to request an alternate time to take the final exam in case of conflicts*
May 5-9:	Prep Week
May 13:	Cumulative Final Exam 7:30 am Tuesday

*ISU final examinations policy will be followed absolutely: <http://www.registrar.iastate.edu/students/exams>.

SYLLABUS STATEMENTS ON SAFETY, BEHAVIOR, RESPECT, AND UNIVERSITY POLICIES

Accessibility Statement

Iowa State University is committed to advancing equity, access, and inclusion for students with disabilities. Promoting these values entails providing reasonable accommodations where barriers exist to students' full participation in higher education. Students in need of accommodations or who experience accessibility-related barriers to learning should work with Student Accessibility Services (SAS) to identify resources and support available to them. Staff at SAS collaborate with students and campus partners to coordinate accommodations and to further the academic excellence of students with disabilities. Information about SAS is available online at www.sas.dso.iastate.edu, by email at accessibility@iastate.edu, or by phone at 515-294-7220. **Students with academic accommodations MUST communicate with the course instructor.**

Religious Accommodation

Iowa State University welcomes diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request the reasonable accommodation for religious practices. In all cases, you must put your request in writing. The instructor will review the situation in an effort to provide a reasonable accommodation when possible to do so without fundamentally altering a course. For students, you should first discuss the conflict and your requested accommodation with your professor at the earliest possible time. You or your instructor may also seek assistance from the [Dean of Students Office \(https://studentassistance.dso.iastate.edu/\)](https://studentassistance.dso.iastate.edu/) at 515-294-1020 or the [Office of Equal Opportunity \(https://www.eoc.iastate.edu/\)](https://www.eoc.iastate.edu/) at 515-294-7612.

Discrimination and Harassment

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. Veteran. Inquiries regarding non-discrimination policies may be directed to [Office of Equal Opportunity \(https://www.eoc.iastate.edu/\)](https://www.eoc.iastate.edu/), 3410 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515-294-7612, Hotline 515-294-1222, email eooffice@iastate.edu.

Prep Week

This class follows the Iowa State University Prep Week policy, as noted in the [ISU Policy Library \(https://www.policy.iastate.edu/\)](https://www.policy.iastate.edu/) and the [Senior Vice President and Provost's website \(https://www.provost.iastate.edu/faculty-success/guidelines\)](https://www.provost.iastate.edu/faculty-success/guidelines).

Mental Health and Well-Being Resources

At Iowa State, we're committed to your success and well-being. As a Cyclone, you can access 24/7 resources, services, and people dedicated to helping you achieve your goals and be your best in and out of the classroom. Whether you need academic support or just someone to talk to, we're here for you at [Cyclone Support \(https://cyclonesupport.iastate.edu/\)](https://cyclonesupport.iastate.edu/). If you are struggling emotionally and need support, there's confidential help available 24/7/365. You can call or text 988 or use the chat at www.988lifeline.org.

- Wellbeing resources for students: <https://cyclonehealth.iastate.edu/>
- Thielen Student Health Center call (515) 294-5801 (24/7 Medical Advice) or via the website (<https://cyclonehealth.iastate.edu/health-clinic>);
- Student Counseling Services call (515) 294-5056 or via the website (<https://counseling.iastate.edu>)
- Recreation Services call (515) 294-4980 or via the website (<http://recservices.iastate.edu>)
- Students dealing with heightened feelings of sadness or hopelessness, thoughts of harm or suicide, or increased anxiety may contact the ISU Crisis Text Line (Text "HELLO" to 741741) or contact the ISU Police Department (515) 294-4428.

Public Health

If you are not feeling well, please stay home and focus on your health. Should you miss class due to illness, it is your responsibility to work with your instructor to arrange for accommodations and to make up coursework, as consistent with the instructor's attendance policy.

Classroom etiquette, mutual respect and professionalism

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Please refrain from distracting behavior during class (talking, texting, emailing, watching videos, etc.). It is the instructor's goal to promote an atmosphere of mutual respect in the classroom. Please contact the instructor if you have suggestions for improving the classroom environment.

Name, gender identity and/or gender expression

Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me accordingly early in the semester so that I may make appropriate changes to my records.

Academic Dishonesty

The class will follow Iowa State University's policy on academic misconduct ([5.1 in the Student Code of Conduct](#) or <https://www.policy.iastate.edu/policy/SDR>). Students are responsible for adhering to university policy and the expectations in the course syllabus and on coursework and exams and for following directions given by faculty, instructors, and ISU Test Center regulations related to coursework, assessments, and exams. Anyone suspected of academic misconduct will be reported to the [Office of Student Conduct in the Dean of Students Office](#): <https://studentconduct.dso.iastate.edu/know-code-resources/facultystaff>. Information about academic integrity and the value of completing academic work honestly can be found in the [Iowa State University Academic Integrity Tutorial](#): <https://iastate.pressbooks.pub/academicintegrity/>.

Free Expression

Iowa State University supports and upholds the First Amendment protection of freedom of speech and the principle of academic freedom in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner.

No employee, student, applicant, or campus visitor is compelled to disclose their pronouns. Anyone may voluntarily disclose their own pronouns.

This course is enrolled in the Iowa State University Immediate Access ONE Program.

What is Immediate Access ONE? This is the next stage of the ISU Book Store's successful Immediate Access program. This is a digital-first, flat-rate course materials program launching Fall 2024 for all undergraduate students, designed to boost your success. Immediate Access ONE provides a predictable cost of \$259 per semester for all undergraduate students, regardless of your major. On the first day of classes of every semester, you can easily access and start using your required course materials by simply logging into your Canvas account.

You are automatically enrolled in this program, so you don't need to sign up.

What is the cost of this program and how is the student billed? Each undergraduate student is assessed a \$259 charge in the Fall and Spring Semester. The charge is \$69 for Winter and Summer terms. This charge includes all required print and digital titles regardless of major. On your ubill in Student Workday you should see a transaction description "University Bookstore-Immediate Access ONE Program-Textbooks".

Can I opt out of Immediate Access? Yes, students have the option to opt out of Immediate Access ONE via Canvas within the **first 10 days from the start of classes**. If you opt out during this period, you will receive a refund. If you change your mind, you can also re-enroll in Immediate Access ONE via Canvas within the first 10 days of classes. Please note that the opt out button may not appear until shortly before classes start as when it shows up can depend on when your instructor creates the Canvas course or has published it.

How do I access the required digital content? Click on the **Immediate Access link located on the Canvas course on the left side Navigation menu**. After you click on the link you will see item cards with the titles. For ebooks you can simply click on the "Read Now" button on the item card. For all digital content, such as homework platforms, there will be instructions on the item cards on how to access your digital content.

How do I get my print materials? Required print materials are available for pick up at the Iowa State University Book Store located in the Memorial Union. Students will receive an email from the bookstore shortly before classes start on how and when they can pick up those required print materials.

For more information on Immediate Access ONE and other FAQs go to <https://www.isubookstore.com/immediate-access-one-students>.

For further questions about Immediate Access please email immediateaccess@iastate.edu.