

## Chem 2210 Physical Chemistry I Fall 2023

### Instructor:

Professor Marsha I. Lester

[milester@sas.upenn.edu](mailto:milester@sas.upenn.edu)

Office: Chem 262 (Cret Wing)

Phone: 215-898-4640

Lester Drop-in Hours (in Person)

### Teaching Assistants:

TA Office Hours

**Syllabus:** Chapters 1-10, 12-13 of Engel; topics covered are listed below and detailed on Canvas; not all sections of text will be covered. Supplementary enrichment topics from other chapters and literature will be included.

**General overview and objective:** Introductory quantum mechanics, atomic and molecular structure, chemical bonding, and microscopic understanding of physical and chemical properties of molecules. This physical chemistry course builds upon topics broached in introductory courses, improves depth and understanding, and emphasizes concepts behind equations, as opposed to an emphasis on merely using equations.

### Topics to be covered:

From Classical to Quantum Mechanics; The Schrödinger Equation; Postulates and General Principles of Quantum-Mechanics; Applying Quantum-Mechanical Principles to Simple Systems: Free particle, Particle in One-, Two-, and Three-Dimensional Boxes; Applying the Particle in the Box Model: Finite Depth Box, Potential Barriers, Tunneling, and Real-World Applications; Commuting and Non-commuting Operators and Heisenberg Uncertainty Principle; Quantum-Mechanical Model for the Vibration and Rotation of Molecules; Vibrational and Rotational Spectroscopy of Diatomic Molecules; Hydrogen Atom and Many Electron Atoms; Chemical Bond in Diatomic Molecules; Molecular Structure and Energy Levels for Polyatomic Molecules; Electronic Spectroscopy; Math Essentials

### Text

***Quantum Chemistry and Spectroscopy 4e, Thomas Engel***

Here is the link to purchase etext. Other options through Publisher or Amazon (Hard Cover, Loose Leaf, or Rent).

### The class will take place in person

MWF 10:15-11:14 am, LRSM Auditorium

See bonus point for class participation / Poll Everywhere

Recitations:

### Ed Discussions to facilitate course communication:

This term we will be using Ed Discussions / Ed STEM for questions and discussion outside of class time and office hours. The system is highly catered to getting you help fast and efficiently from classmates, the TAs, and myself. Rather than emailing questions directly to the teaching staff, please consider posting your questions on that platform.

**Recitations:** Small group work during recitations and associated weekly homework assignments. Working plenty of suggested homework problems is essential for learning the material and performing well on the exams.

**Exams:** Three exams during semester, and final exam during the final exam period. No makeup exams will be given, except for serious illness or other emergency (both require official documentation).

**Course grades:** The grade will be based on completion of homework, hour exam scores, final exam and bonus points.

**Grading Scale:** > 97% **A+**, 97-90 **A**, 90-80 **A-**, 80-75 **B+**, 75-70 **B**, 70-65 **B-**, 65-55 **C**, 55-50 **D**, < 50 **F**. Exam scores may be adjusted to ensure that the final class average is not below a B.

**Grading:**

Weekly homework assignments

Exam 1

Exam 2

Exam 3

Final Exam

Bonus Points

TOTAL

Drop lowest Exam score

Bonus Points: Class participation / Poll Everywhere, mid-semester feedback, etc.

Course action notices need to be filed to receive credit for Poll Everywhere on missed lectures.

**Regrades:** Regrades must be requested in writing within 24 hours after the exams are returned to students, preferably immediately after recitation. If a regrade is requested, the entire exam will be reexamined.

**Resources:** The course moves quickly and will be challenging. Please stay current with the material. We are here to help you. Welcome to Chem 2210!

**Tutoring Resource through Weingarten Center:**

Two excellent students from Chem 2210-2220 in prior years are serving as tutors through the Weingarten Center!

Link to the Weingarten Tutoring page – Using this link will accommodate the appropriate registration process for all students (those who have not used these services and need a registration meeting or those who can just submit their request online): <https://wlrc.vpul.upenn.edu/tutoring-services/>

- a. Link to submit a request for a tutor (only usable for students who are already registered with Weingarten): <https://uapps.vpul.upenn.edu/tutoring-tutee>
- b. Link to make an appointment to become registered with Weingarten: <https://upenn-accommodate.symplicity.com/>

Questions? Contact Valerie Leduc Wrenn [vwrenn@upenn.edu](mailto:vwrenn@upenn.edu)

**Important Dates:**

Drop Period Ends

Last Day to Withdraw from a Course

**Community in the Chemistry Department at Penn:** One of the goals of the course is to develop a community with a shared appreciation of chemistry, where everyone has a sense of belonging. This can only happen if all members of the course community, the instructor, TAs, and students, work together to create a supportive, inclusive environment that welcomes all students, regardless of their race, ethnicity, gender identity, sexuality, religious beliefs, physical or mental health status, or socioeconomic status. Diversity, inclusion and belonging are all core values of this course and of Penn Chemistry. All participants in this course deserve and should expect to be treated with respect by all other members of the community. If you have any concerns in this area or are facing any special issues or challenges, you are encouraged to discuss the matter with me (set up a meeting by email), or with the Chemistry Undergraduate Office or the Undergraduate Biochemistry Program Office.

**Formal and Informal Accommodations:** The Chemistry Department at Penn is committed to assisting students requiring special accommodations for circumstances that are registered with the Office of Student Disability Services (SDS; <https://www.vpul.upenn.edu/lrc/sds/>). The University of Pennsylvania provides reasonable accommodations to students with disabilities who have self-identified and been approved by the Office of [Student Disabilities Services](#) (SDS). Students need to make arrangements with SDS. If you have not yet contacted SDS and would like to request accommodations or have questions, you can make an appointment by calling SDS at 215-573-9235. The office is located in the [Weingarten Learning Resources Center](#) at Stouffer Commons 3702 Spruce Street, Suite 300. All services are confidential. If you are not formally registered with SDS and experience anxiety, depression, learning disabilities or other issues that affect your ability to fully participate and learn in this class, you are encouraged to check-in with me or with the Chemistry Undergraduate Office or the Undergraduate Biochemistry Program Office (see below) so that we can help you to secure the resources to promote your success.

**Mental Health Resources:** The Chemistry Department is here to support you! Here at Penn Chemistry, we care about the holistic well-being of our students. While focusing on academics, it important to attend to your physical and mental health as well. Anxiety and depression are all too common in high-stress environments. If you are concerned about yourself or a friend, please reach out to either the Chemistry Undergraduate Office or the Chemistry Graduate Office (see below) who will direct you to the appropriate resources. If you, or anybody you know, is in need of mental health care, please refer to the following campus resources: (1) Counseling and Psychological Services, [CAPS](#) 215-898-7021 (off hours and weekends 215-349-5490); (2) Department of Public Safety 215-898-7333, or 511 if imminent danger to themselves or others; (3) Finding Programs for Student Wellness through the [VPUL](#); and (4) [Student Health Services](#).

**For help with any of these issues, please feel free to reach out to the Chemistry Undergraduate Office [Professor Jeffrey Winkler, Undergraduate Chair ([winkler@upenn.edu](mailto:winkler@upenn.edu)) or Ms. Candice Adams, Undergraduate Coordinator ([chemugrad@sas.upenn.edu](mailto:chemugrad@sas.upenn.edu))] or the Chemistry Graduate Office [Professor Dan Mindiola ([mindiola@sas.upenn.edu](mailto:mindiola@sas.upenn.edu)) or Graduate Coordinator ([chemgrad@sas.upenn.edu](mailto:chemgrad@sas.upenn.edu))] who will direct you to the appropriate resources.**