

CHM 336 Physical Chemistry (Section 20848 Spring 2023)

Description

The course introduces various physical principles and their link with chemical phenomena, with primary emphasis on quantum chemistry and brief discussion on chemical kinetics in CHM 336. The objectives include:

1. The student will comprehend quantum theory and basic kinetic theory, and their applications to chemical problems.
2. The student will learn how to use mathematical language to describe various quantum and kinetics models related to chemical problems, including calculus, basic differential equation, and fundamental linear algebra such as matrix.
3. The student will apply quantum theory to understand atomic structure and molecular structure, and how they are characterized by use of molecular spectroscopy.
4. The student will be able to read and explain the trend in scientific graphics.
5. The student will develop critical thinking and problem-solving skills.

Instructor

Dr. Chwen-Yang Shew Email: chwenyang.shew@csi.cuny.edu Office: 6S-242 and online Office hours: Mon and Wed 12:05-12:50 (in-person).

Text Books

1. Primary: Peter Atkins, Julio de Paula and James Keeler, *Physical Chemistry 11th edition* (Oxford University Press, New York, 2018; ISBN: 9780198769866).
2. Supplementary: Solution manual is recommended (ISBN: 9780198807773).

Course Hours

Lecture (in-person): Mon and Wed 8:00 AM – 9:55 AM in 6S-232

Grading

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| Takehome assignments | 20 points |
| Two in-class Quizzes | 20 points (12 (higher) + 8 (lower)) |
| Two Midterm Exams | 35 points (25 (higher) + 10 (lower)) |
| Final Examination | 25 points (May 17 Wednesday) |
| Attendance/Technology/Attitude/Participation | 3 points |

Letter Grade

Your letter grade will be assigned roughly according to the following possible cutlines:

90+ A; 85-89 A-; 80-84 B+; 75-79 B; 70-74 B-; 65-69 C+;
60-64 C; 55-59 D; 0-54 F

Policies

1. Classroom: 6S-232 is our designated classroom. Due to its limited space, wearing a mask is essential to protect you and others during the lecture. No recordings are available for in-person lecture.
2. Snow days/instructor quarantine: Lecture will be moved to Zoom online platform.
3. Takehome Assignments: You should be able to download the assignment from Blackboard, and upload your work and answers back to Blackboard "Assignment" link. Every assignment has time limitation. Late submission will result in zero point for your assignment.
4. Quizzes (open book/note): The dates for in-person quizzes will be announced during lecture.
5. Midterm and Final Exams: All are in-person and closed book/note. No notes, books, and electronic devices are allowed during in-person examinations.
6. Late submission of Takehome Assignment: It will be counted as zero point.
7. No flexible grading policy: Flexible grading policy introduced by CUNY in Spring 2020 has ended. Your course grade is final and will appear in your transcript.
8. Syllabus: This syllabus is subjected to be changed depending to the course status and university regulations.
9. Communication: Please allow 24 hours for any of your question (course materials, tests or technical issues) to be answered. Also check your email or Blackboard announcement regularly for any new updates.
10. File types of uploaded files: For grading of your uploaded assignment in Blackboard, the appropriate file formats include PDF, GIF, Word, JPEG and PNG. The file type HEIC is not readable in Blackboard.

Attendance Policy

A student who is absent in excess of 15% of the class hour (4 classes for CHM 336) in the semester is assigned a grade of WU (withdraw unofficially).

Academic Honesty

You must work independently on your quiz or exam. Students who receive or give any help during a quiz or examination are considered cheating and will automatically receive a grade of F for the course.

The following exam rules apply in CHM 336:

1. Open-ended questions in your assignments or tests must be answered in a legible manner, using a graphite pencil and a pen with blue or black ink. Your first and last name should be PRINTED.
2. All students must submit the signature page posted together this syllabus through Blackboard, with their names printed, signed and dated to the instructor to initiate the grading system.
3. Plagiarism in any form, such as copying the answers of homework, quizzes and exams from other students or from any other electronic and non-electronic sources, will result in a failing grade.
4. **No cell phone, including smartwatch, or any electronic devices with a communication component, such as emails, text messages, and/or image exchanges, etc, is allowed in any in-person quizzes or in-person exams. Violating this policy will result in a failing course grade.**
5. We will impose the most severe penalty to those who cheat in our assignments and tests. Particularly, those use online (paid or unpaid) tutors to help them answer questions.

6. Exchanging answers during tests in any forms including electronic communication is severe cheating behavior and those who commit cheating will receive the maximum penalty allowed by the college.
7. Copying test answers from others has disrupted the integrity and fairness of this course over these years. Remember that when you copy the answers from others or you allow others to copy answers, both parties will be treated as cheating since there is no way to find out who initiates cheating.

Outlines

Unit 1: Chapter 7 Quantum theory

Part 1: Principles (time-independent Schrodinger Equation approach)

Part 2: Motions of a quantum particle

Part 3: Applications: UV-VIS spectroscopy and IR spectroscopy

Unit 2: Chapter 8 Atomic structure and atomic spectra

Part 1: Hydrogenic atoms

Part 2: Angular momentum (orbital and spin angular motion)

Part 3: Multiple-electron atoms and periodic table

Part 4: Basis of atomic spectroscopy of an atom

Unit 3: Chapter 9 Molecular structure: Valence bond and Molecule Orbital theory

Part 1: Schrodinger equation, Diatomic molecules, and molecular orbitals

Part 2: Hybrid orbitals and molecular structure

Part 3: Molecular orbitals of diatomic molecules

Part 4: Matrix and linear algebra in Molecular Orbital theory

Part 5: Conjugated molecules and Huckel Theory

Part 6: Comparison of different quantum models

Unit 4: Chapter 11 Molecular spectroscopy (UV-VIS, IR, and Fluorescence in Unit 1-3)

Unit 5: Chapter 17 Chemical kinetics (if time permitted)

Final Exam schedule: (May 17 Wednesday).

Student agreement

Please sign and upload the agreement posted in the Blackboard Assignment by February 03, 2023. Do not email me your agreement as an attachment.