Physical Chemistry I - Chemical Thermodynamics

CHEM 321, Fall 2020

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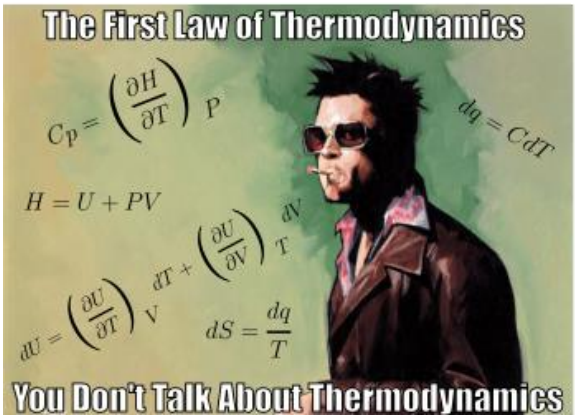


(*Last Revision August 19, 2020*)

This syllabus is your guide to the course. Almost everything you need to know about the readings, course requirements, discussion forum, tests and dates is in this document. Consult it frequently. Please read the syllabus carefully. You are responsible for knowing and following the syllabus. (In the event that I need to make adjustments to the syllabus during the semester, I will post a revision.)

General Course Information

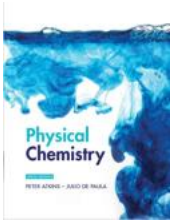
Course Description

Part of a two-semester course sequence (321/322), Chemistry 321 is a physical chemistry course that relies heavily on your understanding and recall of the general chemical principles presented in the introductory course sequence (111/112). Physical chemistry can be broadly defined as the application of physics to chemistry. The physics serves a guide with which we can build various models to explain chemical phenomena. These models include the kinetic theory of gases, collision theory of reactions, etc. The construction of these physical models requires the support of mathematics. Thus, physical chemistry is an inherently mathematical subject matter and can be conceived faster through practice exercises and problem solving. Many problems will be assigned in this course through weekly problem sets, however it is encouraged that students seek to solve as many end-of-chapter problems as possible. 321 specifically focuses on quantitative problem solving in chemical thermodynamics and kinetics. More detailed theoretical insight will be gained about familiar chemistry concepts such as the ideal gas law, entropy, enthalpy, calorimetry, temperature, and catalysis. Students will harness the ability to solve complex problems in these areas and learn to approach chemical problems based on physical insight.

Educational Outcomes

- Make predictions about macroscopic properties given information about the microscopic state of a system.
- Understand equations of state and their power in classifying chemical systems.
- Be able to identify, classify, and quantify the physical state of a system.
- Have an appreciation for the interconnected nature of chemistry, physics, and mathematics.
- Make predictions about systems that are at equilibrium as well as non-equilibrium systems.
- Idenfity and characterize colligative properties of a system.

Textbook(s)



- *Physical Chemistry*, 9th Edition, by Peter Atkins and Julio de Paula, W. H. Freeman Publishing, 2009 [**Required**]
- *Applied Mathematics for Physical Chemistry*, 3rd Edition, by James R. Barrante, Waveland Press, 2016 [**Suggested**]
- Principles of Thermodynamics, 1st Edition, by Myron Kaufman, Marcel Decker Publishing, 2002 [**Suggested**]

Pre-Requisite(s)

CHE 112 (General Chemistry II), PHY 154 (Mechanics), and MTH 162 (Calculus II)

Course Web Site (Blackboard)

Because this is an ONLINE course; significant responsibility falls on you, the student, to keep up with the work and not fall behind!

As you can expect, we will use the course web site on Blackboard for all aspects of this course. Students are expected to check the web site regularly for:

- General Course Announcements & Assignment Updates
- Quizzes, Assignment Submission and Grades
- Discussion Boards
- Course Calendar
- Reference Materials

Any updates to the assignment syllabus will be posted on the course web site. Therefore, if there is a difference between the assignment syllabus and the course web site, information from the course web site should be used. To ensure you receive the maximum credit for your work, follow any templates or guidelines that are provided

Grading Information

Material in any course is not learned or mastered simply by reading the material or watching videos. The student needs to spend the time doing the readings, discussing the issues with fellow students, and doing activities based on the course concepts.

The final grade will be based on individual grades received on homework and programming assignments, quizzes, and exams, group projects and class attendance and participation. Point values for assignments, quiz questions and exam problems are based on the level of effort and knowledge required to complete each. The approximate weighting for each area is as follows:

- **10%** - Discussion Boards
- **10%** - Lecture Quizzes
- **15%** - In-Class Problems
- **20%** - Unit Quizzes
- **30%** - Exams
- **15%** - Final Exam

Course Assignments and Student Responsibilities

Weekly Assignments and Course Organization

Each assignment week begins on a Wednesday and ends on the following Wednesday. In general assignments are due on Wednesday or Friday (by midnight). Here is a brief summary of the assignments you will have each week:

- **Video Lectures** - approximately 5-8 video lectures will be assigned each week. These lectures will be linked in Blackboard and can be found on my YouTube channel.
- **Readings** - sections from the primary text *Physical Chemistry*, 9th Ed, by Atkins and de Paula.
- **Lecture Quizzes** - after doing the assigned lecture viewing and reading there are quizzes available for you to practice, these will be online quizzes where you will be allowed an unlimited number of attempts.
- **Online Discussions** - make at least three posts in the discussion forum each week.
- **In-Class Problems** - during our synchronous class sessions, problems will be assigned. At the end of each unit you are required to submit solutions to all in-class problems given during that week.
- **Unit Quiz** - a unit quiz will be given at the completion of each unit, the quiz will be posted on Wednesday and due by midnight.

Reading Assignments

Reading assignments should be completed as early in the week as possible. Reading the assigned sections gives you an idea of the concepts that are the focus for that week. Each of the other assignments during the week help to explain the concepts in greater depth and give you experience applying them to actual problems. Therefore, since the readings are fundamental to activities for the week, they should be completed first.

For this course to be successful, you must engage in the material by doing the readings ahead of time, and then participating in online and in-class discussions. You will be expected to be an active participant in online and in-class forums by asking questions, joining in our discussion, etc. Note that a significant portion of the grade is attributed to class participation.

Video Lectures

The video lectures for the course present the material in a form different from the textbook so that you can better understand the concepts from each unit. The videos are available on Youtube channel (Professor Derricotte). These lectures range between 8-20 mins in length, they emphasize important concepts and give examples similar to what you would see in a classroom lecture.

Online Discussions

Because this is an online course, the weekly discussions will form an integral part of your grade. To receive full credit for your participation in our discussions, you need to make at least three posts that add substance to the weekly conversation.

Your posts should demonstrate you understand the materials assigned. Your responses might integrate multiple views and/or motivate other students to respond. You should provide evidence that you are reading the assigned materials and other students' postings and bring out interesting interpretations. Don't just demonstrate that you know the facts, but show that you are able to analyze them and handle conceptual ideas. Posts that only state, "I agree" or "That is an interesting idea" are OK in the forum, but they will not receive credit. Feel free to contribute from your personal experiences or your own research or interests.

Each week you need to make your first post to the discussion forums by Friday, by midnight. *Then contribute two additional posts to the forum by Wednesday, midnight.* Each of your posts can earn you up to 5 points for a maximum of 15 points per discussion forum. The higher quality your post, the more points you will earn. There will be a 3 point penalty for each forum in which you do not make your first post by Friday. Posts will not be accepted for grading after the week for the discussion has passed.You can post more than three times in each forum, especially if you feel that your posts may not be of high quality or you have additional comments to make on the topic.

In-Class Problems

During our synchronous class sessions, 1-3 problems will be assigned. These problems are meant to be worked out in a group and facilitated by the instructor. The problems will be posted in the unit folder shortly before class. In order to be prepared for these problem sessions, it is imperative that you keep pace with the assigned readings and video lectures. *If you are unable to finish all of the problems, or you are unable to attend class, you are still responsible for turning in the problems at the end of the unit on Wednesday of that week by midnight*. Assignments that are submitted:

- on time are eligible for full credit based on the rubric for the assignment
- within a week of the due date will be penalized 25%
- more than a week late receive a 50% penalty

Exams

There will be four total examinations in this course, three "in-class" exams and a final exam. Students are to submit their own work on each of the exams. If you need help or clarification on a problem or exercise, you are to make a post on the discussion forum or contact the instructor. The exam will be administered as a timed exam on Blackboard and will be due by midnight of the day it is posted.

- You are not permitted to get help from other students when completing exams.
- Late exams will NOT be accepted.
- The material in this course is cumulative, and so the final exam will be cumulative.

Additional Information

Atttendance

Class attendance is required of all students at Morehouse College. Each student is allowed as many unexcused absences as credit hours for the course. For example, a student is allowed three unexcused absences for a three-credit hour class. A student is expected to attend all classes and not absent himself without adequate cause. It is the responsibility of the student to make up scheduled work missed because of officially excused class absences. Absences from unannounced tests and other assignments may be made up at the discretion of the instructor.

As we are now in a virtual environment, a student's attendance will also be determined by his participation. Bearing this in mind, **students are required to attend all synchronous sessions**. If a student cannot attend a synchronous session, his professor will detail how his participation will be tracked. Once the student receives the maximum number of absences, the professor has the right to have the student administratively withdrawn from the course. The student will be able to monitor his attendance in Blackboard and Starfish.

Academic Integrity

Morehouse is an academic community. All members of the community are expected to abide by ethical standards both in their conduct and in their exercise of responsibilities toward other members in the community. The College expects students to understand and adhere to basic standards of honesty and academic integrity. These standards include but are not limited to the following:

- In projects and assignments prepared independently, students must never represent the ideas or the language of others as their own.
- Students must not destroy or alter either the work of other students or the educational resources and materials of the College.
- Students must not take unfair advantage of fellow students by representing work completed for one course as original work for another or by deliberately disregarding course rules and regulations.
- Unless directed by the faculty member, students should neither give nor receive assistance in examinations.
- In laboratory or research projects involving the collection of data, students must accurately report data observed and not alter data for any reason.

Failure to maintain academic integrity will result in one of the following penalties: failure of the assignment, failure of the course, or possible expulsion. The instructor will determine the seriousness of the offence. The offence will be reported in Starfish and added to the student's academic file.

ADA Academic Accommodations

The College makes reasonable accommodations for all qualified individuals with disabilities. Any student requesting academic accommodations based on his disability isrequired to register with our Student Counseling & Student Accessibility Services Center (the "Center") by emailing SAS@morehouse.edu every semester. A disability accommodation letter can be obtained from the Center. Though faculty will receive an electronic letter from the Center which describes the kind of accommodations, each student who has been approved for accommodations must set up an appointment with the professor to discuss how the accommodations will be applied in each class. If you have any problems concerning the process or would like to be approved for accommodations, please email SAS@morehouse.edu.

Tentative Schedule

Topics Schedule

Aug 19	Week #1	Unit 0	Syllabus, Introduction to the Course
Aug 24	Week #2	Unit 1	Introduction to Physical Chemistry
Aug 31	Week #3	Unit 2	Gases
Sep 7	Week #4	Unit 3	The First Law of Thermodynamics
Sep 14	Week #5	Unit 4	Enthalpy
Sep 21	Week #6	Unit 5	Thermochemistry
Sep 28	Week #7	Unit 6	The Second Law of Thermodynamics
Oct 5	Week #8	Unit 7	Entropy
Oct 12	Week #9	Unit 8	Free Energy
Oct 19	Week #10	Unit 9	Phase Transitions
Oct 26	Week #11	Unit 10	Thermodynamics of Mixing
Nov 2	Week #12	Unit 11	Ideal Solutions and Colligative Properties
Nov 9	Week #13	Unit 12	Equilibrium Electrochemistry

Exam Schedule

Exam 1	Sep 16	Units 0 - 4
Exam 2	Oct 14	Units 5 - 8
Exam 3	Nov 11	Units 9 - 12
Final Exam	TBD	All Units