CHEMISTRY 325- CHEMICAL THERMODYNAMICS Spring 2024

GENERAL INFORMATION

Instructor: T. J. Paskach, 3754 Gilman, Cell Phone: 515-231-7743, email: tpaskach@iastate.edu

Section 2(B): M W F 11:00am - 12:00am Gilman 2109

Section 4(D): M W F 1:10pm - 2:00pm Gilman 1312

Office Hours: MWF 12:00 pm-1:00 PM (unless on travel), or by appointment.
Teaching assistants: Sandita Das sandita9@iastate.edu and Joseph Bequette bequejoe@iastate.edu

Office Hours: Friday 11am-12pm, or by appointment.

LEARNING OUTCOMES and OBJECTIVES

By the end of this course students should be able to understand and apply thermodynamics and equilibrium concepts to practical problems.

- Understanding the concepts of 1st, 2nd, and 3rd law of thermodynamics, and applying them to solve problems that may be encountered in their professional lives.
- Understanding the concepts of chemical equilibrium, and applying them to solve problems related to chemical reactions and phase transformations of materials.

COURSE DESCRIPTION

In Chemistry 325 you will learn fundamental thermodynamic principles including properties of gases, partition functions, the first law of thermodynamics, the second law of thermodynamics, the third law of thermodynamics, Helmholtz and Gibbs energies, phase equilibria and solutions. 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 presented throughout the course. Prerequisites for Chemistry 325 include Chem 178, Math 166. Phys 232 recommended. Chemistry 325 is a 3 credit course.

TEXT

McQuarrie & Simon, *Molecular Thermodynamics*, 1999, University Science Books
Class notes will generally be posted on the course Canvas site. You are welcome to download and print them for your use.

GRADING

Assignments/Problem Sets	15%
First Exam	20%
Second Exam	20%
Third Exam	20%
Final Exam	25%

RE-GRADING

If a student questions the points were given on an exam problem, they should put concerns in writing and submit the written request to the instructor or TA. Re-grade requests must be submitted before the end of the second class period following the one at which the exam is handed back. For instance, if exams are handed back on a Monday, the re-grade request must be submitted before 9:50 am on the following Friday. In the re-grade, the entire exam will be regraded.

EXAMS

There will be three one hour exams and a comprehensive final exam. A scientific calculator is required for the exams. The ± grading system will be used. A minimum of one-week notice will be given for scheduling of mid-term exams. The final exam will be given in the scheduled period during finals week (see b. Graduating seniors must take the final exam. Students are not allowed to use electronic devices (with the exception of a scientific calculator) during the exams. Students are permitted to consult course material (textbook and notes) during the exams. Illegible exams or problem sets will NOT be graded. All work must be presented reasonably neatly and logically; all work MUST be shown. A correct answer that requires without supporting work will receive a score of 0.

Graded exams will be handed back during the following class period and must be returned to the instructor or TA by the end of the class. **Non-returned exams will result in a zero for that exam**.

HOMEWORK

Weekly homework assignments will be posted on Canvas with due dates. No credit will be received for homework sets handed in late. Each problem will get a score of 0 (no reasonable attempt), 1 (reasonable attempt, but not correct), or 2 (correct). Feel free to work with other students on the homework, but you must turn in your own individual set of solutions; collaboration is encouraged. The problem assignments will account for 15% of the grade.

COURSE POLICIES

Late assignments. Problems are due at the start of class on the due date- no exceptions, no excuses, unless the Dean of Students notifies me that you have a personal emergency.
There will be no make up exams. If you miss an exam for a valid medical reason, the average of your other scores will be added at the end of the semester to compensate. An excuse signed by a doctor is required for such accomodation. Otherwise you will receive a zero for the exam missed.
Plagiarism and Academic Misconduct. Academic Misconduct in any form is in violation of Iowa State University Student Disciplinary Regulations and will not be tolerated. This includes, but is not limited to: copying or sharing answers on tests, using unauthorized electronic devices on tests or quizzes, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on the test/assignment, F grade for the course, and

could be suspended or expelled from the University. See Academic Regulations at https://studentconduct.dso.iastate.edu/ for more details and a full explanation of the Academic Misconduct policies.

TENTATIVE CLASS SCHEDULE

Lectures 1-3 Intro and Ch. 1 (The energy levels of atoms and molecules)
Lectures 4-7 Ch. 2 (The properties of gases)
Lectures 8-11 Ch. 3 (Boltzmann factor and partition functions)
Lectures 12-14 Ch. 4 (Partition functions and ideal gases)
Lectures 15-18 Ch. 5 (First law of Thermodynamics)
Lectures 19-23 Ch. 6 (Entropy and second law)
Lectures 24-26 Ch. 7 (Entropy and third law)
Lectures 27-30 Ch. 8 (Helmhotz and Gibbs Energies)
Lectures 31-32 Ch. 9 (Phase equilibria)
Lectures 33-35 Ch. 10 (Liquid-liquid solutions)
Lectures 36-37 Ch. 11 (Liquid-solid solutions)
Lectures 38-40 Ch. 12 (Chemical equilibrium)

EXAM DATES

Exam I Monday, February 12, 2024
Exam II Monday, March 11, 2024
Exam III Monday, April 8, 2024
The final exam is currently scheduled as follows:

Section 2(B) for Thursday, May 9, 2024 (6:30 - 8:30 am) in **Gilman 2109**
Section 4(D) for Tuesday, May 7, 2024 (11:00 am - 1:00pm) in **Gilman 1312**

The ISU final examinations policy will be followed absolutely:
http://www.registrar.iastate.edu/students/exams.
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 (and with Chem 325 as their smallest course). There will be no exceptions. **The last day to request an alternative time for the final exam is 5 pm on Thursday Apr 25th.**

OTHER IMPORTANT DATES

Mar. 11-15 2024 – Spring break (no class).
Apr. 19 2024 – Last day to drop the course without extenuating circumstances.
Apr. 25 2024 – Last day to request an alternative time for the final exam.
May 3 2024 – Last day of class.

STUDENTS WITH DISABILITIES

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting

accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/ . Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

CLASSROOM ETIQUETTE

It is expected that you will respect your fellow students and the instructor during the class. Cell phone and other electronic communication device use during lecture is strictly forbidden. People who engage in this or other distracting behavior during class will be asked to leave.

ILLNESS OR OTHER EMERGENCIES

If you have a health issue or other emergency that requires you to miss multiple classes, you are advised to contact the Dean of Students Office (http://www.dso.iastate.edu/sa) who can contact all of your instructors on your behalf. You also should contact your academic adviser to keep them informed of your situation.

PREP WEEK

This class follows the Iowa State University Prep Week policy as noted in the university catalogue: https://catalog.iastate.edu/academics/#examinationstext.

HARASSMENT AND DISCRIMINATION

Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Student Assistance at 515-294-1020 or email dsosas@iastate.edu, or the Office of Equal Opportunity and Compliance at 515-294-7612.

RELIGOUS ACCOMMODATION

If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor will review the request. You or your instructor may also seek assistance from the Dean of Students Office or the Office of Equal Opportunity and Compliance.

OTHER INFORMATION

If you are experiencing, or have experienced, a problem with disability accommodations, academic misconduct, dead week policies, harassment and discrimination, or religious accommodations, email academicissues@iastate.edu.

RIGHT TO PRIVACY ACT

The Federal Right-to-Privacy Act prohibits the instructor from public disclosure of exam scores.
You may obtain your exam scores in person from your TAs or the Canvas grade book.
The instructor and the TAs are prohibited from giving grades over the phone or e-mail.