

## CHEM 3413-P01 Physical Chemistry I FALL 2019

**Instructor:** Harshica Fernando, Ph.D.  
**Section # and CRN:** P01 12738  
**Office Location:** 230H, E. E. O'Banion  
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**Office Hours:** M 12-2, TR 8-9.30  
**Mode of Instruction:** Face to Face

**Course Location:** New Science Building – Room 103  
**Class Days & Times:** MWF 11:00- 11:50 a.m.

**Prerequisites:** MATH 2043

**Co-requisites:** None

**Catalog Description:** CHEM 3413. Physical Chemistry. (3-0) Credit 3 semester hours. A rigorous treatment of thermodynamics (Laws), thermo-chemistry, application of thermodynamic laws to gases (ideal and real), chemical equilibria, ionic equilibria, and electrochemistry.

**Required Text:** Physical Chemistry”, P. W. Atkins, Julio dePaula, and James Keeler Oxford,

**Recommended Text:** “Physical Chemistry”, K. J. Laidler, Meiser, and Sanctuary, Edition:4th, ISBN 0-618-12341-5  
“Physical Chemistry”, R. J. Silbey, R. A. Alberty and M. G. Bawendi, Wiley, 2004,

### Access to Learning Resources:

PVAMU Library:

Telephone: (936) 261-1500; web: <http://www.pvamu.edu/pages/3585.asp>

University Bookstore: Telephone: (936) 261-1990;

web: <http://www.bkstr.com/webapp/wcs/stores/servlet/StoreCatalogDisplay?langId=-1&storeId=10734&demoKey=d&catalogId=10001>

### Course Overview:

**CHEM 3413** is a lecture course focusing on fundamental principles of Physical Chemistry. The Course will emphasize the study of the behavior of real and ideal gases, basic laws of thermodynamics, the nature of chemical equilibrium, and elementary chemical kinetics. The course will present the underlying theory of chemical phenomena through theoretical and practical problems. A major emphasis will be placed upon solution of numerical problems as a way of demonstrating the underlying theory and practical applications of Physical Chemistry.

Many activities will require use of computer skills as an adjunct to the development of problem solving abilities and the Skill to synthesize and apply knowledge in new contexts.

**Course Learning Objectives/Accrediting Body** *American Chemical Society (ACS) Standards*  
**Met: A, C, E, F**

At the end of this course, the student will

- Demonstrates knowledge of the relationship between work and force and the role of classical mechanics in the understanding of gas behavior
- Understand the role of the Kinetic Molecular Theory of Gases in developing the concept of pressure of an ideal gas
- Understand the concept of partial pressure and the rate of effusion and the concept of collisions and compression in gas behavior
- Understand the nature of heat and the first law of thermodynamics
- Understand the concept of state function, system, and equilibrium
- Understands how to separate the concepts of energy, heat, and work and define the first law in terms of these quantities
- Understand the concept of enthalpy and its relationship to endothermic and exothermic processes and heat capacity
- Understand how to apply Hess's Law to calculate Enthalpy changes for various classes of reactions under various conditions using tabulated values
- Understand the Carnot cycle and its role in the development of the concept of Entropy
- Understand the molecular interpretations of entropy and be able to calculate entropy changes for various categories of reactions
- Understand the concept of Equilibrium as it relates to the Gibbs and Helmholtz energies
- Demonstrate the ability to perform calculations for measurement of the Gibbs and Helmholtz Energies for various chemical reactions
- Understand Maxwell Relations and the Euler Reciprocity Theorem as tools to derive thermodynamic equations of state
- Understand the concept of dynamical equilibrium and its relationship to the Equilibrium Constant and Gibbs Energy
- Understand the role of the Gibbs Energy and Entropy in the explanation of homogeneous and heterogeneous solutions and phases in chemical systems.

## Major Course Requirements

### Method of Determining Final Course Grade

Course Grade Requirement	Value	Total
Hour Exams	3X100	300
Final Exam		100
Quizzes		100
<b>Total: (subject to change at the discretion of the instructor)</b>		<b>500</b>

### Grading Criteria and Conversion: [%]

A = 90%

B = 80 – 89%

C = 70 – 79%

D = 60 – 69%

F = 59% or below

## Course Procedures or Additional Instructor Policies

### Taskstream

Taskstream is a tool that Prairie View A&M University uses for assessment purposes. One of your assignments may be considered an "artifact," an item of coursework that serves as evidence that course objectives are met. More information will be provided during the semester, but for general information, you can visit Taskstream via the link in eCourses.

### Exam Policy

Exams should be taken as scheduled. Makeup examinations will be allowed if and only if a verifiable, university approved document is submitted immediately after the exam. All exams will be counted or included in the final class total. Only Scratch paper and ACS approved Periodic Table will be provided to students. There should be no expectation of a formula sheet for in class exams. Formulas are only provided during final exams and during in class exams at the discretion of the instructor. Students must be able to recall formulas need at the time of an exam. Students need to bring Calculator. No cell phones are permitted during exams as calculators. The provision of Scantron (blue or green color) and Pencils (No. 2) are the responsibility of each student.

**Students with excused absences will be allowed to take make-up exams within a limited period of time and at a time designated by instructor. If an exam is missed and the instructor is not notified in a reasonable time frame a zero will be recorded.**

## Semester Calendar

- Week 1:** Introduction, The Properties of Gases
- Week 2:** Boyle's Law/Charles's Law, Equation of State for Ideal Gases
- Week 3:** Kinetic Molecular Theory, Real Gases
- Week 4:** First Law of Thermodynamics, Thermodynamic Systems and State Functions, Equilibrium States and Reversibility-
- Exam I**
- Week 5:** Energy, Heat and Work, Thermochemistry
- Week 6:** Ideal Gas Relationships, Real Gases
- Week 7:** The Second Law of Thermodynamics, The Carnot Cycle, Irreversible Processes
- Week 8:** The Concept of Entropy, The Third Law of Thermodynamics
- Exam II**
- Week 9:** The Gibbs Free Energy, The Gibbs-Helmholtz Equation
- Week 10:** Chemical Equilibrium, Heterogeneous Equilibrium
- Week 11:** Temperature Dependence of Equilibrium, Pressure Dependence of Equilibrium
- Week 12:** Phase Equilibria, Vaporization and Vapor Pressure, Raoult's and Henry's Laws
- Exam III**
- Week 13:** Partial Molar Quantities, The Chemical Potential, Colligative Properties
- Week 14:** One-Component Systems, Binary Systems, Ternary Systems
- Week 15:** Course Review
- Week 16:** **FINAL EXAMINATION**

## **Student Support and Success**

### **John B. Coleman Library**

The library and its partners have as their mission "to provide resources and instructional material in support of the evolving curriculum, as a partner in Prairie View A&M University's mission of teaching, research, and service" and to support the University's core values of "access and quality, diversity, leadership, relevance, and social responsibility" through emphasis on ten key areas of service. It maintains library collections and access both on campus, online, and through local agreements to further the educational goals of students and faculty.

### **Center for Academic Support**

The Center for Academic Support (CAS) offers Tutoring via peer tutoring. The services include workshops (i.e., Save My Semester, Recalculate Your Route), seminars (i.e., Tools You Can Use: TI-84), group review sessions (i.e., College Algebra Topic Reviews, GRE Preparation), group study opportunities (i.e., TSIA, HESI, Study Break, Exam Cram), and test-taking strategies (How to take Notes, Study Buddy, 5 Day Study Guide). The Tutoring Center is a nationally certified tutoring program through the National Tutoring Association. The peer tutors are trained and certified by the coordinator each semester. Location: J.B. Coleman Library

### **COMPASS**

The Center for the Oversight and Management of Personalized Academic Student Success (COMPASS) is designed to help Prairie View students in their second year and beyond navigate towards graduation by providing the following services: Academic Advisement, Targeted Tutorials for Personalized Learning, Campus-Wide Referrals, and Academic & Social Workshops. Location: J.B. Coleman Library

### **Writing Center**

The Writing Center provides student consultants on all aspects of the writing process and a variety of writing assignments. Writing Center consultations assist students in such areas as prewriting, brainstorming, audience awareness, organization, research, and citation. Location: Hilliard Hall 121

## **University Rules and Procedures**

### **Disability statement (See Student Handbook):**

Students with disabilities, including learning disabilities, who wish to request accommodations in class should register with the Services for Students with Disabilities (SSD) early in the semester so that appropriate arrangements may be made. In accordance with federal laws, a student requesting special accommodations must provide documentation of their disability to the SSD coordinator.

### **Academic misconduct (See Student Handbook):**

You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with your Student Handbook, especially the section on academic misconduct. Students who engage in academic misconduct are subject to university disciplinary procedures.

### **Forms of academic dishonesty:**

1. Cheating: deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.
2. Academic misconduct: tampering with grades or taking part in obtaining or distributing any part of a scheduled test.
3. Fabrication: use of invented information or falsified research.
4. Plagiarism: unacknowledged quotation and/or paraphrase of someone else's words, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one's own work also constitutes plagiarism.

### **Nonacademic misconduct (See Student Handbook)**

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under nonacademic procedures.

### **Sexual misconduct (See Student Handbook):**

Sexual harassment of students and employers at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action.

## **Attendance Policy**

Prairie View A&M University requires regular class attendance. Excessive absences will result in lowered grades. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in assignment of a grade of "F". Absences are accumulated beginning with the first day of class.

## **Student Academic Appeals Process**

Authority and responsibility for assigning grades to students rests with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the Undergraduate Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.

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## **TECHNICAL CONSIDERATIONS**

### **Minimum Recommended Hardware and Software:**

- Intel PC or Laptop with Windows 7; Mac with OS X; Smartphone or iPad/Tablet with Wi-Fi
- High speed Internet access
- 8 GB Memory
- Hard drive with 320 GB storage space
- 15" monitor, 800x600, color or 16 bit
- Sound card w/speakers
- Microphone and recording software
- Keyboard & mouse
- Most current version of Google Chrome, Safari, Internet Explorer or Firefox

**Note:** Be sure to enable Java & pop-ups

### **Participants should have a basic proficiency of the following computer skills:**

- Sending and receiving email
- A working knowledge of the Internet
- Proficiency in Microsoft Word (or a program convertible to Word)
- Proficiency in the Acrobat PDF Reader
- Basic knowledge of Windows or Mac O.S.

### **Netiquette (online etiquette):**

Students are expected to participate in all discussions and virtual classroom chats as directed. Students are to be respectful and courteous to others on discussions boards. Foul or abusive language will not be tolerated.

### **Technical Support:**

Students should go to <https://mypassword.pvamu.edu/> if they have password issues. The page will provide instructions for resetting passwords and contact information if login issues persist. For other technical questions regarding eCourses, call the Office of Distance Learning at 936-261-3283

### **Communication Expectations and Standards:**

Emails or discussion postings will receive a response from the instructor, usually in less than 48 hours. Urgent emails should be marked as such. Check regularly for responses.

### **Discussion Requirement:**

Online courses often require minimal to no face-to-face meetings. However, conversations about the readings, lectures, materials, and other aspects of the course can take place in a seminar fashion. This will be accomplished by the use of the discussion board. The exact use of discussion will be determined by the instructor.

**It is strongly suggested** that students type their discussion postings in a word processing application and save it to their PC or a removable drive before posting to the discussion board. This is important for two reasons: 1) If for some reason your discussion responses are lost in your online course, you will have another copy; 2) Grammatical errors can be greatly minimized by the use of the spell-and-grammar check functions in word processing applications. Once the post(s) have been typed and corrected in the word processing application, it should be copied and pasted to the discussion board.