

Survey of Physical Chemistry

(Thermodynamic, kinetic, & quantum mechanical models for interpreting & predicting the behavior of Matter)

CHEM-3510

Fall '07

Purpose: This course is designed for chemistry majors in the pre-professional track. The course explores the basis of fundamental thermodynamic, kinetic, and quantum mechanical models that are used for interpreting and predicting the behavior of matter. The thermodynamic and kinetic models deal with bulk matter while the quantum mechanical models deal with the behavior (both physical and chemical) observed at the atomic and molecular level.

Learning Outcomes: Each student will acquire a basic understanding of thermodynamic, kinetic, and quantum mechanical relations and be able to mathematically manipulate these models to get meaningful and useful equations in order to solve for given tasks. Also, the student will be able to distinguish which model to use based on the experimental conditions (*ideal versus non-ideal*) and to make the necessary assumptions necessary for the chosen model.

Instructor:	Professor Spencer Slattery
Phone:	(678)839-6550
E-mail:	sslatt@westga.edu (You must use your MyUWG address)
Office Hours:	Mon & Wed (9:45 – noon; 1:15 - 3:45 pm); Room (2136)
Class Meetings:	Tues. & Thurs. (11:00 a.m. - 12:15 p.m.)
Location:	TLC Building (Room 2105)
Text:	“Elements of Physical Chemistry” 4 th Edition (Author: Peter Atkins & Julio de Paula)
Note:	General Chemistry and other Physical Chemistry texts may be helpful for understanding the topics in this course.

Evaluation: Your *course grade* will be computed as shown below:

A (90 - 100%); B (80 – 89%); C (70 – 79%); D (60 – 69%)	Percent of Total
Homework	10%
*Exam #1	18%
*Exam #2	18%
*Exam #3	18%
*Exam #4	18%
Comprehensive Final Exam (Tues., Dec. 11 ^h ; 11:00 am– 1:00 pm)	18%
Total	100%

*The date of each test will be announced at least one week in advance. **Cheating will not be tolerated. Any infraction will be taken before the disciplinary committee and played out to the fullest extent.**

Tentative List of Topics to be covered:

Assigned problems (exercises from the back of each chapter) will be announced in class at the start of each new chapter. The assigned problems will be turned in (on an announced day). [**First assignment is for Chapter 1: 7, 10, 14(a), 19, 21, 22, 26, 28, 30(a,c), 31, 34, 35(a,b)**]

I. The Properties of Gases (Chapter 1)

- A. Equations of State
- B. Kinetic Model of Gases
- C. Real Gases

II. Thermodynamics: The First Law (Chapter 2)

- A. Conservation of Energy
- B. Internal Energy (U) & Enthalpy (H)
- C. Enthalpy (H)

III. ThermoChemistry: (Chapter 3)

- A. Physical Change
- B. Chemical Change

IV. Thermodynamics: The Second Law (Chapter 4)

- A. Entropy (S)
- B. Gibbs Free Energy (G)

V. Phase Equilibria: Pure Substances (Chapter 5)

- A. Thermodynamics of Transition
- B. Phase Diagrams

VI. Principles of Chemical Equilibrium (Chapter 7)

- A. The Equilibrium Constant (K)
- B. Acids and Bases

VII. Rates of Reactions (Chapter 10)

- A. Empirical Chemical Kinetics
- B. Reaction Rate
- C. Temperature Dependence of Rxn Rates

VIII. Quantum Theory (Chapter 12)

- A. Failure of Classical Physics
- B. Structure of Single Electron Atoms
- C. Structure of Multi-Electron Atoms

IX. Atomic Structure (Chapter 13)

- A. Hydrogenic Atoms
- B. Structure of Many Electron Atoms
- C. Periodic Trends in Atomic Properties

X. The Chemical Bond (Chapter 14)

- A. Valence Bond Theory
- B. Molecular Orbitals