

Syllabus Chem-A306-001 Physical Chemistry (Fall 2003)

Prerequisites: CHEM A105-A108, A200, A201; MATH A257, A258.

Office Hours:

Instructor: Dr. Thomas Spence 865-2266

Mon. and Wed. 8:30 – 10:00

Office: Monroe Hall Room 420 tgspace@loyno.edu

Text: Physical Chemistry 3rd edition by Robert J. Silbey and Robert A. Alberty

Suggested Supplementary Text: Applied Mathematics for Physical Chemistry 2nd edition by James R. Barrante

Also, be sure to bring a Calculator to class.

Course Goals

*“Apparently there is color, apparently sweetness, apparently bitterness,
in fact there are only atoms and the void.” Democritus*

Physical Chemistry involves the application of mathematics and physics to chemical transformations, *i.e.* the physics of the rearrangement and redistribution of atoms, molecules, and energy taking place during a chemical reaction. Topics for this first semester of physical chemistry include an introduction to thermodynamics and experimental kinetics as well as an overview of several common laboratory techniques including nuclear magnetic resonance spectroscopy.

Thermodynamics treats the flow of energy in chemical reactions and phase transitions and permits the calculation of equilibrium conditions for a reacting system. Thermodynamics also addresses the spontaneity of chemical reactions answering the questions: how far toward products will a reaction proceed before it stops and how much energy will be released or consumed in the process? We will begin our study of thermodynamics by deriving useful equations for “ideal” systems consisting of large numbers of noninteracting billiard-ball-like atoms and molecules. We will then discuss models chemists use to account for nonideal conditions (all real systems are nonideal!).

Kinetics, on the other hand, addresses the question: how long will it take a reaction to reach equilibrium? Kinetic theory treats chemical reactions on an atomic scale, deriving equations from the treatment of individual collisions that may or may not lead to a reaction. Taken together, these two subjects provide the physics “backbone” for more advanced topics found in all fields of chemistry and chemical engineering including elucidation of reaction mechanisms, catalysis, metabolic pathways, energy transfer process in biological systems, etc.

Take-Home Quizzes

In addition to regular homework assignments, I will occasionally (~1 per book chapter) assign a graded take-home quiz. Unlike the regular homework assignments, these quizzes are to be completed without help from other students. However, you can still request help on a quiz from the instructor. The lowest score of these take-home quizzes will be dropped.

Exams

Three in-class exams are scheduled plus a final that will be cumulative. Missed exams cannot be made up. Students with an approved excuse for an in-class exam will have their average in-class exam score calculated from the remaining 2 exam scores.

Grade

The final grade will be determined by a weighted average of the final exam score, average exam score, and average take-home quiz score. The scores will be weighted by:

Average Exam Score:	1
Average Quiz Score:	1
Final Exam Score:	0.5

Late Work

Work submitted after a deadline will be assessed an immediate 20% penalty and an additional 20% per day following the first 24 hours after the deadline.