

Master Syllabus

Department: Chemistry, Geoscience, and
Environmental Science

Course Prefix/Number: CHEM 323

Official Course Title: Physical Chemistry I

Master Syllabus approved by department on: _____

I. Catalog Description

A study of chemical thermodynamics and its application to chemical equilibrium; the macroscopic properties of matter including real gases, solutions, and phase changes; chemical kinetics

II. Prerequisites: MATH 209; PHYS 202, or approval of department head

III. Expanded Course Description

This course is an introduction to the mathematical and physical laws that describe chemical processes at equilibrium and the rates of chemical reactions. In the thermodynamics portion, the mathematical relationships between the macroscopic properties of a system will be studied and applied to systems both in lecture and lab. The systems studied include chemical processes involving gases, solutes, solids, and phase changes in both pure substances and mixtures. The chemical kinetics portion of the course studies the rates of chemical reactions and the factors that influence them. This includes the experimental determination of rate laws for chemical reactions and the derivation of reaction mechanisms to consistent with the rate laws.

IV. Intended Student Knowledge Outcomes

Knowledge Outcomes: Lecture

- 1) Students will learn the empirical method of problem-solving and inquiry.
- 2) Students will learn the basic laws of Thermodynamics and their significance in the real world.
- 3) Students will learn how to apply the methods of calculus appropriately to the construction of models of the real world.
- 4) Students will learn the correct use of scientific units and significant figures in the presentation of results.
- 5) Students will learn the historical development, terminology, and methods of physical chemistry.
- 6) Students will learn how to obtain rate laws from experimental rate data.
- 7) Students will learn how to deduce reaction mechanisms for reactions given an experimentally determined rate law and show that a particular reaction mechanism is consistent with the observed rate law.

Knowledge Outcomes: Laboratory

- 1) Students will learn the empirical method of problem-solving and inquiry.

- 2) Students will learn how to properly record laboratory observations and data in a professional-style research notebook.
- 3) Students will learn how to write a scientific document properly.
- 4) Students will learn how to compose a lab report following a professional format spelled out in the *ACS Style Guide*.
- 5) Students will learn the process of publishing a scientific document by submitting a nearly complete report, having it edited, and resubmitting the final report with the corrections made.
- 6) Students will learn how to use computer programs such as Excel to manipulate their data to produce graphs and calculate desired quantities.
- 7) Students will learn the correct use of scientific units and significant figures in the presentation of results.
- 8) Students will learn how to obtain rate laws from experimental rate data.
- 9) Students will learn how to show that a particular reaction mechanism is consistent with the observed rate law.

V. Course Requirements

There is a four-hour lab attached to this course. In order to pass this course, the student must pass both the lab and lecture portion separately.