

Chem 102: Fundamentals of Chemical Reactivity with Environmental Applications

Course description: Introduction to thermodynamics and kinetics for chemical transformations in the environment. First and second laws of thermodynamics. Equilibria including acid base chemistry. Kinetics of one step and multiple step reactions, with an introduction to transition states and reactive intermediates. Application of these chemistry concepts to the atmosphere and oceans. Laboratory builds on the experience of Chem 101, with practice in developing routine skills. Continued emphasis is given to reporting data accurately.

Pre-requisites: Chem 101

Goal
Develop an understanding of the phenomenological thermodynamics and its consequences for chemistry
Develop an understanding of the first and second laws of thermodynamics and its applications
Develop an understanding of the concepts of state and path functions
Develop an understanding how heat and work are measured in chemical processes
Develop an understanding of the concept and applications of standard states
Development an understanding of the behaviour of gases and gas mixtures
Develop an understanding of the concept of reversibility and its relation to equilibrium
Develop the ability to apply the concepts of acidity and basicity to aqueous systems with respect to equilibria
Develop an understanding of kinetics
Develop the ability to apply the concept of energy barriers to chemical reactions
Develop an understanding of the concepts and applications of catalysis
Develop an understanding of the concepts and applications of kinetics for one-step and multistep reactions
Develop an understanding of transition states and reactive intermediates
Develop an understanding of how reaction conditions affect aspects of chemical reactivity including the distinction between thermodynamic and kinetic control
Develop the ability to relate chemical structure to observable properties
Develop the ability to apply concepts of chemical reactivity and kinetics to environmental processes
Develop an understanding of the chemical aspects of energy production and usage by society
Develop an understanding of the chemical aspects of the effect of society on the environment
Develop the ability to perform chemical measurements and analysis
Chemistry Program Goals
Develop competence in problem solving.
Develop the ability to design, conduct and observe chemical experiments and to record and critically analyze data from chemical experiments.
Develop the ability to work competently, independently and safely in a laboratory environment.
Develop the ability to apply error analysis and determine significant figures.
Develop the ability to apply mathematics to chemistry.
Develop an understanding of the use of models, their premises, advantages and limitations.
Develop the ability to disseminate scientific information orally and in writing.
Develop an understanding of the impact and relevance of chemistry in society.