Chemical Kinetics and Thermodynamics

Chemistry 360

Section: D100

Term: 2002 Summer

Instructor: Dr. I. Gay

Office: SSB-7100.

Discussion Topics: General Course Description:

Elements of physical chemistry from a macroscopic point of view. Thermodynamics, and its applications to chemical equilibrium. Kinetics.

3 lecture hours/week; 1 tutorial hour/week; 0 lab hours

Topics:

Week 1. Gases

Weeks 2-4. The First Law of Thermodynamics

Definitions/Terminology. Work, Heat and Energy. The First Law. Expansion work. Heat and Enthalpy. State Functions and Exact Differentials. Cp. Cv. Adiabatic Changes in State. Thermochemistry, Enthalpy Changes. Temperature Dependence of Reaction Enthalpies. Hess's Law, Born-Haber Cycle.

Weeks 5-8. The Second Law of Thermodynamics

Spontaneous Change. Entropy and Irreversible Change. Second Law of Thermodynamics. Third Law of Thermodynamics. Helmholtz and Gibbs Energies. Properties of the Gibbs Energy. The Chemical Potential. Spontaneity and Equilibrium. The Gibbs Energy Minimum, Response of Equilibria to Temperature and Pressure.

Weeks 9-13. Empirical Chemical Kinetics

Determination of Reaction Rates. Rate Laws, Determination of Order. Complex Reactions: Parallel and Opposing Reactions. Consecutive Reactions. The Steady-State Approximation. Chain and Radical Combination Reactions. Polymerization Kinetics. Branching Reactions, Explosions. Fast Reaction Techniques. Molecular Reaction Theories. Potential Energy Surfaces. Thermodynamic Formulation of TST.

Grading: Problem Sets 20%; Mid-terms 20%; Final Exam 60%.

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Required Texts: Atkins, "Physical Chemistry", 6th Edition, 1998. Publishers: Freeman & Co.

Recommended Texts: None

Materials/Supplies: None

Prerequisite/Corequisite: Prerequisite: CHEM 122 (or 103), MATH 152 (or 155) and PHYS 121 (or 102). Chemistry majors should take MATH 251 before CHEM 360. Students may not count both CHEM 360 and CHEM 261 for credit.

Notes: None

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