CHEMISTRY 503 SYLLABUS
SPRING 2017
Lecture MWF 10:10-11 Fulmer 124

Practical Solution Kinetics, Inorganic Reaction Mechanisms, and Solution Thermodynamics

The first 7 weeks of this course will examine the theory and practice of kinetics for reactions in solution. Methods of acquiring and analyzing data, establishing rate laws, the relationship between the rate law and proposed mechanisms, temperature and pressure dependences, and transition state theory will be included. The last 4 weeks will be devoted to a discussion of some reaction mechanisms, especially substitution and electron transfer. A middle section of 4 weeks will focus on discussions of the thermodynamics (equilibrium constants/free energy, entropy, enthalpy) of metal complexation and hydrolysis reactions, experimental methods of determination of free energies, correlation of same to predict stability of unknown species, and prediction of speciation of metal complexes in solution.

Instructor: Prof. Scot Wherland
Email: scot_wherland@wsu.edu
Phone: 335-3360
Office: Fulmer 151
Office Hours: Tu 9-10, W 11-12, and by appointment

Instructor: Prof. Ken Nash
Email: knash@wsu.edu
Phone: 335-2654
Office: Fulmer 639A
Office Hours: By appointment

Blackboard: https://learn.wsu.edu

Textbook: (Recommended) "Chemical Kinetics and Reaction Mechanisms" by J. H. Espenson, McGraw Hill, 2nd Ed. (1995)
"Metal Ions in Solution" by J. Burgess, Ellis Horwood (1978)

Grading:		
	1 "hour" exam on kinetics	100
	1 "hour" exam on mechanism	100 (during final exam time)
	Kinetics homework	200 (normalized)
	Thermodynamics homework/exam	200
	Total	600

Grades (no lower than): A: 100-90% B: 80-89.9% C: 70-79.9% D: 60-69.9% F: <60%

Scheduled Final Exam Time: Wednesday, May 3, 2014 from 8:00 – 10:00 AM

Homework: Kinetics homework is typically due by 5 PM on Monday following the assignment. Several of the homework assignments will involve computer applications, primarily with Excel and with software distributed on the web site. The homework assignments will involve problems that are too long to be included in exams, and thus contribute as much to the final grade as do the exams.

The thermodynamics section will emphasize exercises to increase student familiarity with existing thermodynamic databases and the combination of thermodynamic databases with regression analysis software like HYSS2009 for practical applications like generating metal complex speciation predictions.

Learning Outcomes

Students who successfully complete this course should

Be able to design a variety of types of kinetic experiments and data analysis methods that will lead to an experimental rate law.

Be able to derive a rate law from a chemical mechanism.

Be able to suggest mechanisms that are consistent with a particular rate law, and the mechanistic ambiguities that remain.

Be able to derive activation parameters from temperature and pressure dependence data and be able to understand the possible interpretations of such values within transition state theory.

Be able to evaluate other experimental results related to stoichiometry, thermodynamics, or rate constants that may contribute to mechanistic proposals, such as solvent and ionic strength effects, product ratios in reactions that do not lead to a unique product, the influence of reactant structure on rate constants, and variations with thermodynamic driving force.

Be familiar with the standard mechanisms of transition metal substitution and electron transfer reactions and the experimental results that support or eliminate a particular mechanism.

Be able to evaluate and manipulate thermodynamic data describing complexation and redox reactions of metal ions and metal complexes in aqueous solution.

Be able to recognize the important difference between thermodynamic and kinetic stability/instability.

Syllabus Statements

Reasonable Accommodations

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center. For more information contact a Disability Specialist. Pullman: 509-335-3417, Washington Building 217; http://accesscenter.wsu.edu, Access.Center@wsu.edu

Academic Integrity

You are encouraged to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. First offenses on homework will result in a zero for that assignment, with later offenses resulting in greater penalties. Students who allow their work to be copied are as much at fault as the student who copies. Repeat offenses, or particularly egregious offenses as determined by the instructor, will result in an F as a final grade in this course, and the student may not have the option to withdraw from the course and may be reported to the Office of Student Conduct. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions."

Safety and Emergency Notification

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the "Alert, Assess, Act," protocol for all types of emergencies and the "Run, Hide, Fight" response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI's Run, Hide, Fight video and visit the WSU safety portal.

Chem 503 Schedule Spring 2017

Week	Topic	Assignments/Exams
Jan. 9	Kinetics	
Jan. 16	Kinetics	Hw 1 Due (Mon, 5pm)
Jan. 23	Kinetics	
Jan. 30	Kinetics	
Feb. 6	Kinetics	
Feb. 13	Kinetics	
Feb. 20	Kinetics/Mechanism	Kinetics Exam (Fri)
Feb. 27	Metal ion thermodynamics	
Mar. 6	Metal ion thermodynamics	
Mar. 13	Spring Vacation	
Mar. 20	Metal ion thermodynamics	
Mar. 27	Metal ion thermodynamics	
Apr. 3	Mechanism	Thermodynamics Exam (Mon)
Apr. 10	Mechanism	
Apr. 17	Mechanism	
Apr. 24	Mechanism	
May 3	Wednesday, May 3, 8-10 AM	Mechanisms Exam (Wed.)