

CHEM 773: Physical Biochemistry (3 credits) **Spring 2016**

Class Meeting: MW 4:00 p.m.-5:15 p.m. in room MPE 104

Prerequisites: CHEM 475 (Biochemistry II) and graduate standing

Text: Physical Chemistry for the Biological Sciences, 2nd ed. (G. G. Hammes and S. Hammes-Schiffer; 2015)

Course Description: Theory and practice of physical chemistry as applied to the structure, properties, and interactions of biochemical macromolecules. Includes thermodynamics, spectroscopy, electrophoresis, ligand binding, and hydrodynamic methods (covering the theoretical aspects of diffusion, sedimentation, and viscosity).

Learning Outcomes: Students will learn physical chemistry concepts and theories that are relevant to biochemistry. Students will understand and use equations to calculate thermodynamic values, molecular attributes, and hydrodynamic parameters. By the end of this course, the following outcomes are expected.

1. Students will be able to explain the relationships between enthalpy, entropy, and Gibbs free energy, and calculate ΔH , ΔS , and ΔG values for biochemical reactions.
2. Students will be able to explain the temperature-dependence of chemical equilibria and calculate equilibrium constants at different temperatures using the van't Hoff equation and other equations.
3. Students will be able to explain the temperature-dependence of chemical kinetics and calculate rate constants using the Arrhenius equation and other equations.
4. Students will be able to explain the concepts of Stokes radius and frictional coefficient, and calculate values for these parameters from sedimentation and diffusion experimental data.
5. Students will be able to explain the relationship between Stokes radius and elution behavior during gel filtration chromatography, and will be able to critically evaluate different strategies for molecular weight estimation.
6. Students will be able to explain theoretical concepts in ligand binding, including the statistical relationship between micro and macro equilibrium constants. Students will be able to use Scatchard plots and various ligand-binding equations to calculate equilibrium constants, fractional saturation values, and Hill coefficients.
7. And much more!

Exams: Midterms will be on Mon. March 7, 2016 and Mon. April 18, 2016, during the usual class period (4:00 p.m.-5:15 p.m.). The Final Exam will be on Mon. May 9, 2016 (6:00 p.m.-8:00 p.m.).

Grading: There will be two midterm exams (100 points each), a final exam (150 points), and graded homework (150 points), for a total of 500 points possible. Grading Scale: > 90% = A or A-, > 80% = B+, B, or B-, > 70% = C+, C, or C-, > 60% = D, < 60% = F. This grading scale may be adjusted if necessary to produce an appropriate grade distribution.

Make-Up Exams: The following policies apply: (1) If a student must be absent during an exam, accommodations for make-up can be arranged only if the student notifies the instructor (by phone call or voice-mail message to 702-895-1687) prior to the start of the exam. Planned absences (due to scheduled travel, etc.) should be discussed as far in advance as possible. Failure to take the exam at its regularly scheduled time or make prior arrangements with the instructor may result in a score of zero for that exam. (2) Any make-up accommodations are solely at the discretion of the instructor. (3) The format and scoring system used for make-up exams may differ from those used for the regular exam.

Standard University Policies:

Academic Misconduct — Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the Student Academic Misconduct Policy (approved December 9, 2005) located at: <https://www.unlv.edu/studentconduct/student-conduct>.

Copyright — The University requires all members of the University Community to familiarize themselves **with** and to follow copyright and fair use requirements. **You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws.** Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: <http://www.unlv.edu/provost/copyright>.

Disability Resource Center (DRC) — The UNLV Disability Resource Center (SSC-A 143, <http://drc.unlv.edu>, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Religious Holidays Policy — Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor within the first 14 calendar days of the course for fall and spring courses (excepting modular courses), or within the first 7 calendar days of the course for summer and modular courses, of his or her intention to

participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit:

<http://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

Transparency in Learning and Teaching — The University encourages application of the transparency method of constructing assignments for student success. Please see these two links for further information:

<https://www.unlv.edu/provost/teachingandlearning>

<https://www.unlv.edu/provost/transparency>

Incomplete Grades — The grade of I—Incomplete—can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student’s control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. Graduate students receiving “I” grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the I grade.

Tutoring and Coaching — The Academic Success Center (ASC) provides tutoring, academic success coaching and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, visit <http://www.unlv.edu/asc> or call 702-895- 3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of the SSC (ASC Coaching Spot). Drop-in tutoring is located on the second floor of the Lied Library and College of Engineering TEB second floor.

UNLV Writing Center — One-on- one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The student’s Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at:

<http://writingcenter.unlv.edu/>.

Rebelmail — By policy, faculty and staff should e-mail students’ Rebelmail accounts only. Rebelmail is UNLV’s official e-mail system for students. It is one of the primary ways students receive official university communication such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. Students’ e-mail prefixes are listed on class rosters. The suffix is always @unlv.nevada.edu. **Emailing within WebCampus is acceptable.**

Library Resources — Students may consult with a librarian on research needs. For this class, the subject librarian is https://www.library.unlv.edu/contact/librarians_by_subject. UNLV

Libraries provides resources to support students' access to information. Discovery, access, and use of information are vital skills for academic work and for successful post-college life. Access library resources and ask questions at <https://www.library.unlv.edu/>.

Final Examinations — The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. See the schedule at: <http://www.unlv.edu/registrar/calendars>.

Class Schedule (subject to change):

	Date	Topic
Mon.	01/18/16	No Class Meeting: Martin Luther King Day Holiday
Wed.	01/20/16	Thermodynamics (Chaps. 1, 2, 3)
Mon.	01/25/16	Thermodynamics (Chaps. 1, 2, 3)
Wed.	01/27/16	Thermodynamics (Chaps. 1, 2, 3)
Mon.	02/01/16	Thermodynamics (Chaps. 1, 2, 3)
Wed.	02/03/16	Thermodynamics (Chaps. 1, 2, 3)
Mon.	02/08/16	Thermodynamics (literature)
Wed.	02/10/16	Kinetics (Chaps. 5, 6)
Mon.	02/15/16	No Class Meeting: Presidents Day Holiday
Wed.	02/17/16	Kinetics (Chaps. 5, 6)
Mon.	02/22/16	Kinetics (literature)
Wed.	02/24/16	Micro-rate Constants (literature)
Mon.	02/29/16	Sedimentation (Chap. 18)
Wed.	03/02/16	Sedimentation (Chap. 18)
Mon.	03/07/16	Midterm #1 (100 points)
Wed.	03/09/16	Sedimentation (literature)
Mon.	03/14/16	Sedimentation (literature)
Wed.	03/16/16	Diffusion (Chap. 18)
Mon.	03/21/16	No Class Meeting: Spring Break
Wed.	03/23/16	No Class Meeting: Spring Break
Mon.	03/28/16	Viscosity (Chap. 18)
Wed.	03/30/16	Electrophoresis (Chap. 18)
Mon.	04/04/16	Electrophoresis (literature)
Wed.	04/06/16	Ligand Binding/Scatchard Plots (Chap. 17)
Mon.	04/11/16	Ligand Binding/Scatchard Plots (Chap. 17)
Wed.	04/13/16	Ligand Binding (literature)
Mon.	04/18/16	Midterm #2 (100 points)
Wed.	04/20/16	Spectroscopy (selected topics from Chaps. 10, 11)
Mon.	04/25/16	Spectroscopy (selected topics from Chaps. 10, 11)
Wed.	04/27/16	Spectroscopy (selected topics from Chaps. 10, 11)
Mon.	05/02/16	Spectroscopy (selected topics from Chaps. 10, 11)
Wed.	05/04/16	Spectroscopy (literature)
Mon.	05/09/16	FINAL EXAM [6:00 p.m. - 8:00 p.m.] (150 points)