

Chemistry 6620 - (Bio)physical chemistry

6620 section 01 (graduate students)
4620 section 01 (advanced undergraduate students)

Instructor: Dr. Thomas Leeper, SL3006, tleeper@kennesaw.edu, (470) 578-2258

Office Hours: Mondays and Thursdays 10am-11am or by appointment: <https://thomas-leeper.youcanbook.me>

Location: SC215 (in person)

Days & Times: TuTh 11am – 12:15pm

Description: Paper reading class examining biophysical methods to study proteins and nucleic acids. These will include nuclear magnetic resonance spectroscopy (NMR), X-ray crystallography and mass spectrometry plus other techniques. Extensive participation and discussion required. Recommended prerequisite: Any biochemistry course at any university.

Course objectives:

- Develop an understanding of the molecular basis of biochemical behavior;
- Become comfortable with the methods and concepts of physical chemistry;
- Acquire expertise in the mathematical approaches used to help model and predict molecular behavior;
- Utilize the Laws of thermodynamics to explain the driving forces in reactions;
- Recognize the factors that affect chemical and physical equilibria, and demonstrate the ability to predict outcomes based on physical laws;
- Apply the principles of elementary kinetics to perform standard computational analyses of kinetic data and identify the simplifications employed in common kinetics experiments;
- Discriminate between the importance of covalent and that of non-covalent bonding in biological systems;
- Explain how spectroscopic techniques are used to probe molecular structure and dynamics.

Textbook: Tinoco, Sauer, Wang, Puglisi, Harbison, Rovnyak, *Physical Chemistry – Principles and Applications in Biological Sciences*. 5th Edition, Pearson 2014. **Any (old) version is allowable/recommended!**

Expected Prior Learning. A "C" or higher in Calculus I and II, and a previous one- or two-semester course in Physical Chemistry. A B.S. degree in Chemistry, Biochemistry, or Biology is assumed.

Schedule (tentative) (shift by 510 days? Holidays to consider: Jan 18th M N/R and Mar 8-15. Last m5/3

Jan 12 th	Syllabus and biochemistry minireview
Jan 14 th and 19 th	Intro to thermodynamics (<i>pp 139 to 142</i> and sections from ch. 1-5 as needed).
Jan 21 st	Isothermal titration calorimetry of high affinity metalloprotein: <i>Paper discussion:</i> Blasie & Berg, <i>JACS</i> , 2003 , 125, 6866-7.
Jan 26 th and 28 th	Random walk and biomolecular motion (Chapter 8)
Feb. 2 nd	Introduction to fluorescence (<i>pp 507 to 520</i> and rest of Ch. 13 as needed).
Feb 4 th	Motion of G-protein coupled receptor(s) in membrane via FRET <i>Paper discussion:</i> Murakoshi et al. <i>PNAS</i> , 2004 , 101, 7317-22.
Feb. 9 th and 11 th	Wavefunctions, electron density, and Fourier transforms (ch 11)
Feb 16 th and 18 th	Bonds, intermolecular forces, and molecular structure (ch. 12 and 15)
Feb 23 rd	<i>Paper discussion:</i> Kendrew et al. <i>Nature</i> , 1958 , 181, 662-6.
Feb 25 th	NMR (Ch. 14)
Mar 2 nd	Using NMR to observe intermediates during protein unfolding. <i>Paper discussion:</i> Augustyniak and Kay <i>PNAS</i> , 2018 , 115, E4786-95.
March 4th	Midterm exam – <i>paper to read in advance TBD</i>
March 9 th and 11 th	<i>Spring break</i>
March 16 th to April 22 nd	Student lead paper discussions; must satisfy course objective!
April 27 th and 29 th	Demo days and/or article writing discussion
Tues. May 4th (finals)	Peer eval. + Final paper submission due at 5pm. Meet in Sc215 10:30am.

Grading Policy:

25% of grade determined by paper discussion and demo participation (evaluated by the instructor)

25% determined by midterm exam

25% of grade by peer and faculty evaluation of student lead paper discussion.

25% final paper (article review), extra credit possible.

Grading scale: A (90.00%), B (78.00%), C (65.00%), D (50.00%), F (<50%).

Attendance. You are expected to attend regularly. Ultimately, you are responsible for any material missed due to an absence. In addition, you are expected to check D2L daily for materials and announcements.

Disability: Any student with a documented disability needing academic adjustments is requested to notify the instructor as early in the semester as possible. Verification from KSU disAbled Student Support Services is required (see Student Center room 267). All discussions will remain confidential.

Student athletes: Student athletes are required to contact their course instructor during the first week of class with their schedule of planned events that are away from campus.

Academic Honesty:

Any student involved in academic dishonesty such as plagiarism or similar misconduct will probably receive a grade of F for the assignment and, depending upon the severity of the infraction, the class. Further procedures such as submission of an electronic academic integrity incident form and possibly a formal hearing by the Department of Student Conduct and Academic Integrity, may result as described by the provisions of the [*Academic Misconduct Disciplinary Process.*](#)

Face Masks in the classroom

As mandated by the University System of Georgia, the university requires the use of face masks in the classroom and in KSU buildings to protect you, your classmates, and instructors. Per the University System of Georgia, anyone not using a face covering when required will be asked to wear one or must leave the area. Repeated refusal to comply with the requirement may result in discipline through the applicable conduct code. Reasonable accommodations may be made for those who are unable to wear a face covering for documented health reasons. Please contact Student Disability Services at sds@kennesaw.edu for student accommodation requests.

F2F & Shifting Modalities

This course will be delivered as a Face-to-Face course with limited online content delivery. However, please note that the university reserves the right to shift teaching modalities at any time during the semester, if health and safety guidelines require it to do so. Some teaching modalities that may be used are F2F, Hyflex, Hybrid, or online, both synchronous and asynchronous instruction.

Staying Home When Sick

If you are ill, please stay home and contact your health professional. In that case, please email the instructor to say you are missing class due to illness. Signs of illness include, but are not limited to, the following: cough, fever of 100.4 or higher, runny nose or new sinus congestion, shortness of breath or difficulty breathing, chills, sore throat, and new loss of taste and/or smell. Plans for remote access will need to be made to ensure continuous participation in discussion.

Seating Plans

Students will sit in the same seat for every F2F class so that the instructor can use a seating plan for contact tracing if a student contracts Covid-19.