

Summer 2016 Syllabus for CHEM 470/570 and BIOS 470X/570X

Course Information:

- Title: General Biological Chemistry
- Credit Hours: 3
- Term: Summer 2016
- Course Location and Time: LaT (La Tourette Hall) 201, MoTuWeTh 9:30 to 10:45 a.m.

Instructor Contact Information:

- Gary M. Baker, Ph.D., Director of Graduate Studies, Assistant Chair
Department of Chemistry and Biochemistry.
- Office Location: LaT 426
- Communication: Email: gbaker@niu.edu; Office hours: Immediately after class MoTuWe.

Course Description:

- Applies general and organic chemical concepts to selected biochemical topics. Topics include, but are not limited to, modes of action of drugs, allosteric regulation, pH-dependent switches, kinetic and catalytic mechanisms, and bioengineering. Chemical structures of practical compounds and macromolecules are examined and models are developed to illustrate how structure can determine properties and function. Basic concepts of experimental design and data analysis/reporting are also examined.

Student Learning Outcomes:

- Distributed on Blackboard.

Student Assessment:

- Level 400 students - Letter grade cutoffs:
Grade based on four exams, each 100 points. 400 points possible, although extra credit points will likely be available on each exam.
A: 380 and above C+: 288 to 312
A-: 360 to 379 C: 260 to 287
B+: 344 to 359 D: 220 to 259
B: 328 to 343 F: 219 and below
B-: 313 to 327
- Level 500 students - Letter grade cutoffs:
Grade based on four exams (same as those taken by level 400 students), each 85 points. In addition, students in CHEM 570 or BIOS 570X will complete four assignments, each 15 points, related to published scientific articles. These assignments must be submitted in the Assessments section on Blackboard (which automatically checks for plagiarism). Due dates are listed there but will be staggered with exam dates.

Important: C-, D, F, and WF have the same impact as a "U" for graduate students.

A: \geq 380	C+: 296 to 311
A-: 360 to 379	C: 272 to 295
B+: 344 to 359	C-: 256 to 271
B: 328 to 343	
B-: 312 to 327	

Some downward adjustment to the lower letter grade cutoffs may occur at the end of the summer term when the grades are compiled and the whole class trends are evident.

Course Resources:

- **Textbook:**
None is required. UC at Davis has a wiki [resource on biological chemistry](#) that can serve as an online resource. Primary resource for exam preparation is a series of course modules posted on Blackboard.
- **Blackboard:**
Course modules are posted in the Content section on Blackboard. These modules are the primary source of exam material. In addition, the Content section includes a folder for several scientific articles. As noted above, students registered for CHEM 570 or BIOS 570X use these articles to complete four separate assignments.
- **Databases:**
Used in class and freely accessed using a web browser (which you should do outside of class to augment your learning). Databases include, but are not limited to,
 - The [Protein Data Bank](#) (PDB): Useful for interactively visualizing macromolecular structures, primarily proteins.
 - The [Enzyme Structures Database](#) (EC-PDB): Useful for browsing the enzyme classes and subclasses; also integrated with the PDB.
 - The [PubChem](#): Useful for visualizing the structure and properties of small, practical compounds; also includes toxicity and safety data.

Course Policies and Recommendations:

- Students should review class notes after each class session, and review the relevant course modules before class. Pacing is important, especially given the accelerated summer schedule.
- Regular class attendance is strongly recommended.
- One makeup exam will be allowed, **but only if you missed an exam for a valid, documented reason or emergency** (attending a conference because you're presenting a poster or talk; a medical emergency; vehicular accident; etc.). Reasons such as oversleeping or previously scheduled vacation are not valid. The death of a friend or family member is a common reason offered by students for missed exams, but one that many students are unable to validate. Documentation of proof must be provided at least one week before the scheduled exam, or within a reasonable time frame in the event of an emergency. Fabricated excuses constitute academic dishonesty and university policies on academic dishonesty will apply.
- Excessive reliance on memorization, which generally reflects a fragmented or superficial understanding, will limit your performance in this course. Pace your learning and use reflective strategies (ask how or why and forge connections; don't simply memorize the the what).
- Exam questions follow the format of, or are aligned with, those in the course modules. Some questions will require a written response (his is where over-reliance on memorization often becomes evident). Other questions will assess your command of relevant vocabulary or require a calculation that clearly shows relevant equations and work. You may be asked to sketch and label a graph, or to apply algebraic methods to analyze a graph or table of data. I do not require calculus in this course, but proficiency in algebra is expected. The ability to write clear structural formulas with correct valence and formal charges, or to interpret structures that are given to you using different conventions (perspective formulas, Newman projections, Lewis formulas...), are also expectations. A reasonable background in various areas of general and organic chemistry is needed to understand biochemistry, and this background must be evident in student responses on exams. For example, carbon structures drawn with 5 bonds, or a failure to differentiate fundamental organic groups, such

as amines and amides, illustrate a lack of fundamental background and will limit your success in this course.

Americans with Disabilities Statement.

- Please read and comply with this statement if you require any type of accommodation due to a disability.

Academic Integrity (AI) Statement:

- All students are required to comply with all relevant Academic Integrity (AI) standards. Relevant links can be found [here](#). All students are advised to take the NIU student tutorial on AI if they haven't already.
- Tablets, laptops, and electronic notebooks are allowed in class to access this course's resources on Blackboard or other resources directly related to class content. No cellular device use is allowed during class time and no use of any electronic devices, other than a simple calculator, will be allowed during exams.

Proposed Course Schedule:

- Exams are every two weeks and are based on course modules distributed on Blackboard and the notes you take in class. Exam questions will be similar to or aligned with those in the modules and discussed in class. Reviewing and understanding each module is therefore very important. The exam schedule follows. (**Students in CHEM 570 or BIOS 570X:** A reminder that there are four assignments that you must complete in addition to these exams; due dates are listed in the Assessments section on Blackboard).

Exam 1: Thu, June 23

- Review of the structure and properties of practical compounds, such as nutrients and pharmaceuticals; properties include acid-base, shape, resonance, acid-base, and isomerism. Properties follow from structure which, in turn, determine biological function.

Exam 2: Thu, Jul 7

- Protein structure-function relationships. Allosterism and the Perutz model; hemoglobin variants. Thermodynamic and kinetic methods for studying and analyzing protein-protein and protein-ligand interactions in monomeric and oligomeric systems; role of prosthetic groups.

Exam 3: Thu, Jul 21

- Active site structure of enzymes; role of cofactors; transition state stabilization, diffusion control, and induced fit; kinetic methods for analyzing the binding of orthosteric and allosteric drugs. Mechanisms of enzyme catalysis with emphasis on hydrolases, including the role of general acids and bases in substitution, addition, and elimination mechanisms.

Exam 4: Thu, Aug 4

- Structure and properties of carbohydrates, lipids, and nucleic acids and their interaction with proteins; role in disease.

Taking this course for graduate credit as an undergraduate:

This only applies if the following conditions are all true:

- You are registered for CHEM 470, not BIOS 470X.
- CHEM 470 is an elective course and not a requirement for your undergraduate degree at NIU.
- You plan to apply to NIU's graduate program in the Department of Chemistry and Biochemistry.

Taking this course for graduate credit will allow a waiver of 3 credit hours in the course requirements for the M.S. or Ph.D. degree in the Department of Chemistry and Biochemistry at NIU, contingent on approval by the department's Graduate Program Committee. All interested undergraduates must email the course instructor of their intent within the first two days of classes. In addition, **students must achieve a minimum of 50 out of 60 points on the graduate assignments (equivalent to an 83%) and earn no less than a B in the course.**