

Syllabus for CHEM 472/572 and BIOS 472X/572X

Course Information:

- Title: Biological Chemistry I
- Credit Hours: 3
- Term: Fall 2016
- Course Location and Time: FH (Faraday Hall) 144, TuTh 9:30 to 10:45 a.m.

Instructor Contact Information:

- Gary M. Baker, Ph.D.
Department of Chemistry and Biochemistry.
- Office Location: LaT 426
- Communication: Email: gbaker@niu.edu; Office hours: TuWe 10:45 a.m. to noon.

Course Description:

- Applies general and organic chemical concepts to selected biochemical topics. Topics include, but are not limited to, drug interactions, allosterism, pH-dependent switches, kinetic and catalytic mechanisms, and bioengineering. Chemical structures of practical compounds and macromolecules are examined and models are developed to illustrate structural determinants of 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 100 points, but weighting 85% of the final grade. Level 500 students also complete three assignments, each 20 points, related to published scientific articles. These assignments, which must be submitted in the Assessments section on Blackboard, will weight 15% of the final grade.

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 letter grade cutoffs may occur at the end of the summer term when the grades are compiled and whole class trends become evident.

Course Resources:

- **Textbook:**
None is required, but access to a biochemistry textbook or reliable online resource is recommended. LibreTexts.org has a [free online resource on biological chemistry](#).
- **Blackboard:**
The primary resource for exam preparation is a series of course modules posted in the Content section of Blackboard. In addition, the Content section includes a folder for several scientific articles. Students registered for CHEM 570 or BIOS 570X use these articles to complete three separate assignments.
- **Databases:**
Several will be used in class and all may be accessed with a web browser. It is also recommended that you use these resources outside of class to augment your learning. Databases include, but are not limited to,
 - The [Protein Data Bank](#) (PDB): Useful for obtaining structural information on proteins and interactively visualizing their structures.
 - The [Enzyme Structures Database](#) (EC-PDB): Useful for browsing 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 regularly review class notes and, ideally, soon after each class session. Relevant course modules should be reviewed before class since they are the primary source material for each class (and the exams). Pacing is important. Do not wait until the week of the exam to prepare.
- Regular class attendance is strongly recommended to ensure a good set of notes.
- One makeup exam will be allowed, **but only if you missed an exam for a valid, documented reason, unanticipated event, or emergency**. Valid reasons include professional obligations such as attending a conference or symposium that your faculty advisor can validate; a standardized admissions exam (e.g. MCAT); a sports competition if you're a NIU athlete (and your coach provides documentation); a medical emergency or vehicular accident, if it can be documented. Reasons such as you forgot or overslept, or a 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. Any missed exam without proper validation (as judged by the instructor of record) will receive a zero. Where possible, 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 unforeseen event or emergency. For example, the instructor of record should be emailed at the time of a vehicular breakdown or accident (unless serious). Unreasonable delays will likely result in a zero. Fabricated excuses constitute academic dishonesty and university policies on academic dishonesty will apply.
- Excessive reliance on memorization, which generally results in fragmented or superficial understanding, will limit your performance in this course. Pace your learning, use available resources, and apply reflective strategies (ask how or why), and make connections where

possible; don't simply try to memorize the what.

- Exam problems follow the format of those in the course modules. Some problems will require a written response. Other problems will assess your command of relevant vocabulary or require a calculation that clearly shows relevant equations and work. You will also be asked to analyze or interpret published data and to apply algebraic methods where appropriate. Some proficiency with calculus may be required. The ability to write clear structural formulas with correct valence and formal charges, or to interpret structures presented as line, perspective, or Lewis formulas, Newman projections, etc. are also expectations. A reasonable comprehension 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, a failure to identify fundamental organic groups, such as amines and amides, all 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. Cellular device use is not allowed during class time (unless the instructor grants permission) and no electronic devices, other than a simple calculator, will be allowed during exams.

Tentative Course Schedule:

- Exams are every four weeks and are based on the course modules distributed on Blackboard and the notes you take in class related to the modules. Detailed understanding of each module is very important. The exam schedule follows. (**Students in CHEM 570 or BIOS 570X:** A reminder that there are also three assignments that you must complete in addition to these exams; due dates are listed in the Assessments section on Blackboard).

Exam 1: Thu, September 15, 9:30 to 10:45 a.m.

- 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, October 13, 9:30 to 10:45 a.m.

- 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, November 10, 9:30 to 10:45 a.m.

- 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, December 8, 10:00 to 11:50 a.m.

- 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.**