

Institution: University of Wisconsin

Subject: 200 – Biochemistry

Course title: 625 – Mechanisms of action of vitamins and minerals (001)

Credits: 2

Canvas course url: <https://canvas.wisc.edu/courses/75170>

Course Designations:

General education

Breadth - Physical Sci. Counts toward the Natural Sci req

Level – Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Meeting time and location: Tue/Thr, 9:55 to 10:45 am, Deluca Biochemistry 175

Instructional Mode: Blended

Credit hours are met by the course: 2 credit course, Option A

The course includes 32 lectures of 50 min. Format of the lectures includes Powerpoint presentations by the instructor, white-board drawing sessions led by student groups, in-class collaborative problem sets, and out-of-class problem sets. Two written exams are given. The questions on the exam are queries to propose detailed mechanisms for different classes of cofactors and coenzymes under study, identifications of structure, and short answer descriptions of chemical rationale for various proposals of reaction mechanisms from the published literature.

It is expected students will spend a minimum of two hours working outside of class after each lecture to study presented materials, complete assigned readings, and prepare and review problem sets.

Instructor: Prof. Brian G. Fox, Chair, Department of Biochemistry.

Instructor Availability: By email or request in class for appointment

Instructor Email/Preferred Contact: bgfox@wisc.edu

Teaching Assistant: None assigned

TA Office Hours: Not available

TA Email/Preferred Contact: Not available

Course Description:

Emphasizes the importance of coenzyme and cofactors of enzymes (i.e., vitamins and minerals) in biochemistry. All aspects of the biochemistry of coenzymes will be covered, including their biosynthesis as far as is known, the biochemical reactions they catalyze, their chemical and spectroscopic properties, and the mechanisms by which they facilitate biochemical reactions.

Requisites:

[CHEM 345](#) and previous or concurrent enrollment in [BIOCHEM 501](#) or [507](#); or graduate standing

Course Learning Outcomes:

Learning goals for the undergraduate and graduate levels are included.

Undergraduate-level learning goals: Develop an appreciation of the stereochemical, electronic, and spatial constraints on enzyme reactions; integrate principles from general chemistry, organic chemistry, basic biology and biochemistry into a more detailed understanding of how vitamins and minerals (cofactors and coenzymes) function in living systems; become more fluent in use of the correct terminology when speaking and writing about specific examples from biochemical and organic chemistry background principles.

Graduate-level learning goals: All undergraduate-level learning goals and: obtain an ability to read published literature and evaluate the validity of proposed enzyme mechanisms; obtain an ability to propose experiments that can be used to test specific aspects of a proposed mechanism; prepare concise written descriptions of enzyme active sites and reaction mechanisms.

Each lecture includes a topical review article or primary literature paper that provides context and additional background or specific details. These citations change over time as new publications become available or current state of knowledge advances.

Students will learn to use PyMOL (<https://www.pymol.org>) to visualize protein structures, learn about stereochemical and spatial arrangement of enzyme active sites, and as a guide to drawing more accurate representations of enzyme mechanisms. Assistance in software installation (or access to university resources) and instructor-generated instructional scripts will be provided.

Grading:

Exams (60%), written outside-of-class homework (25%); in-class collaborative problem sets (10%); preparation for and ability to participate in class discussion (5%).

Letter grades of A, AB, B, BC, C, D and F are assigned based on rank-ordering of points achieved in the tasks assigned in the student evaluation rubric. The individual ranking is then correlated and adjusted with achievement of undergraduate- and graduate-specific learning goals as demonstrated by exam performance, out-of-class problem sets, and the combination of in-class collaborative problem solving and overall class participation.