Administrative Unit: Science Department

Course Prefix and Number: CHEM 420L

Course Title: Biochemistry Laboratory

Number of Credit Hours: 2 Lecture Hours: 0 Laboratory Hours: 3

Catalog Description: Laboratory teaching fundamental techniques in biochemistry. Cross-listed as BIOL 420L. Students majoring in biology must earn a grade of C or better. Prerequisites: BIOL 110 and CHEM 210. Concurrent enrollment in CHEM 420 is required. $20 lab fee. Offered every Fall.

Prerequisite(s)/Corequisite(s): Prerequisites: BIOL 110 and CHEM 210. Concurrent enrollment in CHEM 420 is required.

Text(s): Experimental procedures should be taken texts such as: 

- Fundamental Laboratory Approaches for Biochemistry and Biotechnology (Ninfa & Ballou, Fitzgerald Science Press, 1998)
- Protein Purification Protocols (Doonan, Humana Press, 1996).
- Strategies for Protein Purification & Characterization: A Laboratory Course Manual (Marshak et al., Cold Spring Harbor Laboratory Press, 1996)
- Modern Experimental Biochemistry, 3rd ed. (Boyer, Benjamin Cummings, 2001)
- Basic Biochemical Laboratory Procedures and Computing (Jack, Oxford University Press, 1995)

Course Objectives:

- To perform broadly applicable lab techniques in biochemistry
- To acquire facility with laboratory equipment used in modern experimental biochemistry
- To use the scientific method to design and conduct experiments
- To perform and evaluate experiments in the isolation, purification, and analysis of macromolecules
Measurable Learning Outcomes:

- To use critical analysis skills to interpret data and draw conclusions
- To learn scientific writing
- Accomplish experimental manipulations using basic lab equipment such as micropipette, microcentrifuges, ultracentrifuges, spectrophotometers, agarose and polyacrylamide gel electrophoresis chambers
- Write lab reports based on the format used in scientific journals
- Perform calculations to determine molarity, serial dilution, and % weight/volume
- Understand the scientific method by using it in the design and analysis of experiments
- Understand buffers and buffering capacity by manipulating buffers with different concentrations, pH values, pKa values
- Perform isoelectric focusing to determine the isoelectric point of different proteins
- Successfully execute methods in protein isolation and analysis such as differential centrifugation, differential solubility, dialysis, column chromatography, and gel electrophoresis to isolate and purify a specific enzyme from living cells
- Compare and contrast the efficiency and uses of different types of column chromatography in separation, detection, and analysis of macromolecules
- Determine the reaction kinetics and inhibition of specific enzymes
- Use spectrophotometry and colorimetric methods to determine concentrations of protein in unknown samples
- Determine kinetic parameters of specific enzymes for specific substrates and inhibitors
- Detect the presence of specific proteins in a mixed sample using Western blot techniques
- Isolate and analyze subcellular organelles
- Investigate factors that control protein-ligand binding interactions

Topical Outline (major areas of coverage):

- Basic laboratory practices
- Buffers
- Column chromatography (affinity, gel-filtration, ion-exchange)
- Determination of protein concentration
- Separation and analysis of proteins using electrophoresis (isoenzymes, isoelectric focusing, etc.)
- Isolation and purification of enzymes
- Kinetic analysis of purified enzyme
- Western Blot analysis
- Isolation and analysis of subcellular organelles

Recommended maximum class size for this course: 10-12
Library Resources: Online databases are available at http://www.ccis.edu/offices/library/resources.asp. You may access them from off-campus using your eServices login and password when prompted.

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Date: September 12, 2005

NOTE: The intention of the master syllabus is to provide an outline of the contents of this course, as specified by the faculty of Columbia College, regardless of who teaches the course, when it is taught or where it is taught. Faculty members teaching this course for Columbia College are expected to facilitate learning pursuant to the course objectives and cover the subjects listed in the topical outline. However, instructors are also encouraged to cover additional topics of interest so long as those topics are relevant to the course’s subject. The master syllabus is, therefore, prescriptive in nature but also allows for a diversity of individual approaches to course material.

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