Administrative Unit: Science Department

Course Prefix and Number: BIOL 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 CHEM 420L. Students majoring in biology must earn a grade of C or better. Prerequisites: BIOL 110 and CHEM 210. Concurrent enrollment in BIOL 420 is required. $20 lab fee. Offered every Fall.

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

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

- *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
To use critical analysis skills to interpret data and draw conclusions
To learn scientific writing

Measurable Learning Outcomes:
Accomplish experimental manipulations using basic lab equipment such as micropipetters, 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](http://www.ccis.edu/offices/library/resources.asp). You may access them from off-campus using your eServices login and password when prompted.

Prepared by: Julie Estabrooks

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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