

SOUTHEAST MISSOURI STATE UNIVERSITY

Department of Biology

BI 345

Laboratory Methods in Biological Chemistry

New Fall 2001

I. Course Description and Credit Hours:

Theory and practice of common biological laboratory methods: solution preparation, spectrophotometry, electrophoresis, DNA manipulations, and biological, chemical, and radiological safety. One one-hour lecture and two two-hour labs. 3 credits.

II. Prerequisites:

BI200, CH186, MA134.

III. Purposes or Objectives of Course:

- A. To give students experience in dimensional analysis used in microbiology and cellular and molecular biology.
- B. To familiarize the students with the theory and practice of preparing solutions from various starting materials.
- C. To introduce the students to means of preparing sterile media and solutions.
- D. To allow students to practice quantifying bacteria and viruses, and to measure growth rates of bacterial populations.
- E. To allow students to quantify proteins, nucleic acids and other chemicals in solution.
- F. To introduce students to commonly used devices including, but not limited to: microliter pipetters, centrifuges, spectrophotometers, pH meters, etc.
- G. To introduce the students to the use of enzymes for end-point determination and to measure enzyme activity.
- H. To give students experience in the techniques for manipulation and electrophoretic separation of proteins and DNA.
- I. To provide information regarding biological, chemical, radiation, and other aspects of lab safety. Students will receive four hours of radiation safety training in order to achieve certification by the institutional Radiation Safety Officer for radiation work.

IV. Expectation of Students:

Students are expected to attend classes, complete laboratory exercises, allied assignments, and maintain a research notebook. Grades will be based on four unannounced inspections of research notebooks, completion of five on-line calculation assignments in a controlled computer facility, five homework problem sets, and a final exam.

V. Course Content and Outline:

Lecture Content (15 hours)

Dimensional analysis; SI units in Biology (1 hour)
Dimensional analysis; Derived and interchangeable units of concentration (1 hour)
Buffers (1 hour)
Sterile techniques (1 hour)
Dilution factors (1 hour)
Growth curve and kinetics (1 hour)
Literature searches (1 hour)
Statistics and interpolation (1 hour)
Absorbance spectra (1 hour)
Nucleic acid hybridization techniques (1 hour)
Radiotracer methods (1 hour)
Polymerase Chain Reaction (1 hour)
Chemical Safety (1 hour)
Biological Safety (1 hour)
Radiation Safety (1 hour)

Lab Content (58-60 Hours)

Propipettors, Microfuges (2 hour)
Preparing solutions (4 hours)
Weak acid titrations (2 hours)
Behavior of weak acids (2 hours)
Preparing Media (2-4 hours)
Viable cell count, Direct cell count, and Membrane filtration (4 hours)
Spectrophotometric growth curve (4 hours)
Plaque assay (2 hours)
Microscopy (4 hours)
Bradford protein assay (2 hours)
Glucose determination (2 hours)
Lactate dehydrogenase activity (2 hours)
SDS PAGE (4 hours)
Plasmid and chromosomal extractions (4 hours)
Spectrophotometric DNA determination (2 hours)
Absorbance spectra of pigments (4 hours)
Agarose electrophoresis and photography (4 hours)
Chemical Safety (2 hours)
Biological Safety (2 hours)
Radiation Safety (4 hours)

VI. Textbook:

Biochemical Techniques: Theory and Practice. 1987. Robyt, JF and BJ White.
Waveland Press, Inc.

VII. Basis for Student Evaluation:

20% Lab Notebook

30% On-Line Examinations – Competency Based Instruction

30% Homework Problem Sets – Competency Based Instruction

20% Final Exam

Five computer U-tests taken outside of class time.