BIOL 3702L LEARNING OBJECTIVES AND OUTCOMES

This document contains the relevant Learning Objectives and Learning Outcomes for those students enrolled in the laboratory component of BIOL 3702, Microbiology, as taught by Dr. Cooper at Youngstown State University. The laboratory experiences in BIOL 3702 were developed in accord with the recommended curriculum guidelines established by the American Society for Microbiology (https://www.asm.org/Guideline/ASM-Curriculum-Guidelines-for-Undergraduate-Microb).

Students are strongly encouraged to use the following Learning Objectives and Learning Outcomes as a guide to their foundational understanding of microbiology as well as in the acquisition of the technical skills essential to the field.

Laboratory Learning Objectives

Throughout the semester in BIOL 3702L, students will be taught to:

- Utilize aseptic techniques in the safe handling of microbes and to avoid culture contamination;
- Properly and appropriately employ scientific equipment and methods;
- Isolate pure cultures using selective media and the streak-plate method;
- Identify cell morphology and arrangement by microscopy and simple staining;
- Differentiate bacterial species using specific staining techniques;
- Determine physiological differences among bacteria using biochemical assays;
- Enumerate microbes by serial dilution and viable plate counts;
- Assess the effects of physical and chemical agents on microbial growth;
- Evaluate microbial susceptibility and resistance to antibiotics;
- Isolate and identify fecal bacteria in water using the membrane filter technique;
- Communicate scientific concepts, experimental results, and analytical arguments clearly and concisely.

Laboratory Learning Outcomes

Knowledge and skill competencies in BIOL 3702L shall be evaluated through written reports, quizzes, technical demonstrations, and online exercises. In addition, a student's collegiality and professional demeanor shall be observed subjectively.

A student who successfully completes BIOL 3702L shall be able to:

- Practice safe microbiology, using appropriate protective and emergency procedures;
- Demonstrate correct techniques for the isolation, subculture, and maintenance of microorganisms;
- Prepare properly stained specimens for examination using bright-field microscopy;
- Perform pure culture and selective techniques to enrich for and isolate microorganisms;
- Employ appropriate molecular, biochemical, and seiological methods to identify microorganisms;
- Estimate the number of microorganisms in a sample using direct microscopic counts, viable plate counts, and spectrophotometric methods;

- Operate microbiological and molecular biological equipment in a safe and appropriate manner;
- Collect and organize experimental data as well as interpret results from this information;
- Use quantitative reasoning and graphing skills to solve problems in microbiology; and
- Develop collegial and effective working relationships with peers.