Miami Dade College

Course Description

BSC2427L | Biotechnology Methods & Applications 2 Laboratory | 2.00 credits

This laboratory course is designed to complement BSC2427 Biotechnology Methods and Applications 2. This is a hands-on course that emphasizes advanced laboratory principles, techniques, and instrumentation necessary for effective work in a pharmaceutical, biotechnology, and/or research-laboratory setting(s). Prerequisite: BSC2426, 2426L; Corequisite: BSC2427. Laboratory fee.

Course Competencies

Competency 1: The student will demonstrate knowledge, competency, and application of tissue culture techniques by:

1. Describing procedures used in establishing mammalian and plant cell and tissue cultures
2. Explaining the differences between primary cell cultures, cell lines, and cellular senescence
3. Defining the function of plating, isolation, and transfection of cell lines
4. Explaining contamination problems common to cell cultures and implementing the use of proper aseptic techniques during cell culture procedures
5. Maintaining tissue cultures
6. Identifying the biohazards related to tissue culture

Competency 2: The student will demonstrate knowledge of recombinant DNA technology by:

1. Explaining the principles of recombinant DNA technology
2. Conducting Polymerase Chain Reaction (PCR) to amplify a DNA fragment
3. Explaining the purpose of mutagenesis and its role in recombinant DNA technology
4. Performing a DNA ligase reaction
5. Explaining the preparation of bacterial competent cells
6. Performing a bacterial transformation with recombinant DNA
7. Plating transformed cells on a selective medium
8. Listing methods to identify transformants containing the recombinant DNA
9. Selecting clones containing the recombinant DNA
10. Extracting recombinant DNA from cells
11. Estimating the quality and quantity of the recombinant DNA

Competency 3: The student will demonstrate an understanding of gene analysis by:

1. Conducting restriction analysis of recombinant DNA
2. Defining differences between genetic, cytological, and physical maps
3. Performing a non-radioisotopic DNA sequencing protocol to obtain the sequence of the recombinant DNA
4. Conducting comparative computer analyses of the recombinant DNA with genomics and proteomics databases

Competency 4: The student will demonstrate practical knowledge of cellular transfection on plant and mammalian cells by:

1. Explaining the purpose of transfection
2. Conducting transfection of plant tissue using bacterial cells containing recombinant DNA
3. Performing mammalian cell transfection using recombinant DNA
4. Listing methods of selection for plant and mammalian cell transfections
5. Maintaining transiently-transfected plant tissues under greenhouse conditions
6. Selecting and propagating positively-transfected mammalian cell lines

Competency 5: The student will demonstrate knowledge of the isolation and characterization of recombinant proteins by:

1. Defining the techniques used for extraction and purification of recombinant proteins
2. Implementing electrophoresis for qualitative protein analysis
3. Explaining the chemical reaction responsible for the Bradford Assay and its use in determining protein concentration
4. Performing enzyme-linked immunosorbent assay (ELISA)
5. Designing in vitro assays to test the activity of a protein

Competency 6: The student will demonstrate knowledge of the principles of bioremediation technology by:

1. Explaining the bioremediation of hydrocarbons by identifying oil-degrading bacteria in soil
2. Illustrating the use of microorganisms in industrial mining to extract mineral ores and metallic ions from wastewater
3. Demonstrating interdependence of bioremediation and biodegradation through the use of vermicomposting, small-scale composting units, and/or can bioreactors

Competency 7: The student will demonstrate knowledge of the lifecycle of a biotechnology product by:

1. Comparing and contrasting the guidelines for product development for consumption or pharmaceutical applications
2. Explaining procedures, rules, and ethical issues concerning in vivo analysis of proteins designed for
3. Consumption or pharmaceutical applications
4. Describing the federal regulations for the proper use of animals in research, testing, and/or education
5. Describing federal regulations for research dealing with human tissues and subjects
6. Describing the role of the Institutional Review Board (IRB) in maintaining compliance
7. Summarizing the goals and principles of clinical trials
8. Designing a clinical trial for a new protein
9. Discussing the ethical issues in animal research and clinical trials

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning