Miami Dade College

BSC4422L Biotechnology Methods and Applications III Lab

BSC4422L **Biotechnology Methods and Applications III Lab**

Course Description: This course provides students with hands-on laboratory experiences to supplement the BSC4422 lecture course. Students will learn how to perform advanced molecular biotechniques that build on previous knowledge. They will perform diagnostic assays, western blots, purifications, etc and determine how to correlate findings with the basic research or clinical data. Special fee. (4 hr. lab)
Prerequisite: BSC2427L , BSC2427 , BCH3023 , BCH3023L , PCB3060 , PCB3060L
Corequisite: BSC4422

Course Competency	Learning Outcomes
Competency 1: The student will demonstrate knowledge of methods for manual and automated nucleic acid purification and characterization by:	3. Critical thinking 10. Environmental Responsibility
1. Performing a manual DNA and RNA extraction from a sample specimen. 2. Quantitating purified nucleic acid samples by UV spectrophotometry. 3. Explaining the principles of gel and capillary electrophoresis of nucleic acids. 4. Performing a gel-based electrophoretic analysis of DNA.	
Competency 2: The student will demonstrate knowledge of the elements of different methods based on the PCR reaction by:	3. Critical thinking 10. Environmental Responsibility
1. Explaining the principles of the polymerase chain reaction (PCR). 2. Describing steps in the PCR reaction. 3. Listing different applications of PCR (including reverse-transcriptase, multiplex and quantitative PCR) in hematopathology, cancer and infectious diseases. 4. Carrying out an RT-PCR analysis for the molecular detection of chromosomal translocations associated 5. Performing a real-time PCR quantification of DNA with acute and chronic leukemia.	
Competency 3: The student will demonstrate knowledge of restriction analysis, physical mapping and southern hybridization of DNA by:	3. Critical thinking 10. Environmental Responsibility
1. Describing the mechanism of action of restriction enzymes. 2. Listing the applications of restriction enzymes in the molecular diagnosis of hematopathology and other pertinent pathology specimens. 3. Describing the following methods for nucleic acid detection: staining, blotting, hybridization, and fragment length polymorphism analysis.	
Competency 4: The student will demonstrate basic knowledge of tissue cell culture techniques by:	3. Critical thinking 10. Environmental Responsibility

1. Comparing healthy, senescent and transformed cells cultured in vitro. 2. Explaining the processes of cellular division and growth in relation to the cell cycle and how these processes are influenced by internal and external factors. 3. Listing current methods used for the development of primary cell cultures in vitro. 4. Comparing the use of in vivo and in vitro cultures for the establishment, propagation and/or growth of cell, tissue and organ cultures. 5. Discussing protocols for cellular enrichment and characterization in cell cultures. 6. Explaining the development of cell lines from primary cell cultures. 7. Discussing the use of cell lines as models systems for normal and disease states.	
Competency 5: The student will demonstrate knowledge of tissue protein purification and concentration by:	3. Critical thinking 10. Environmental Responsibility
1. Discussing methods for the selective enrichment and/or over-expression of desired proteins. 2. Evaluating preparative and analytical methods for the isolation and quantization of proteins. 3. Listing procedures to reduce and/or control the protein degradation or contamination. 4. Explaining at least three distinct selective methods useful for protein purification and identifying the basis of separation for each type 5. Differentiating between the methods used for detecting and separating proteins 6. Surveying the methods for extraction, filtration, precipitation and desalting proteins 7. Using centrifugation to separate precipitated proteins from the supernatant 8. Discussing the principles and operation of dialysis, diafiltration, ultrafiltration and tangential flow filtration. 9. Analyzing the solubilities of proteins for isolation purposes	
Competency 6: The student will demonstrate knowledge analysis and characterization of proteins by:	2. Numbers / Data 3. Critical thinking 10. Environmental Responsibility
1. Discussing the practical aspects of electrophoresis such as staining and detecting bands, protein blotting and analysis of result 2. Describing the basis of polyacrylamide gel electrophoresis (PAGE), SDS (sodium doecylsulfate) PAGE, native gel electrophoresis, isolectric focusing and 2D electrophoresis 3. Comparing native gels and denaturing gels, non-reducing gels and reducing gels, gradient gels and straight gels, and between stacking gels and resolving gels 4. Interpreting the banding patterns from any of the listed gel types, or combinations of gel types. 5. Performing Western Blotting to detect proteins that react with specific antibodies 6. Comparing the spectroscopic methods to determine protein concentration 7. Using spectroscopic techniques to determine protein concentration. 8. Discussing hazards associated with gel electrophoresis and the purpose of different ingredients in the gel recipes and in sample preparations	
Competency 7: The student will demonstrate knowledge of DNA molecular diagnosis by:	3. Critical thinking 10. Environmental Responsibility
1. Explaining how the nucleotide sequence of DNA is determined 2. Listing applications of DNA sequencing to molecular diagnosis. 3. Describing the method and interpreting results of the molecular diagnostic test for immunoglobulin heavy chain and T-cell receptor gene rearrangements. 4. Describing the clinical settings in which various molecular tests are ordered, including the distinction between diagnostic testing and minimal residual disease testing i.e.: Detection of	

KRAS and EGFR mutations in colon and lung cancer. Patient outcome predictors in AML: FLT3, NPM1 and BRAF mutation analysis. 5. Analyzing and interpreting molecular diagnostic data for hematopathology, genetics and other pertinent pathology specimens; including appropriate reporting and medical significance of positive and negative test results. 6. Correlating molecular diagnostic data with morphology and clinical information in diagnosing hematopathology, genetics and other pertinent pathology specimens. 7. Integrating molecular diagnostic results into hematopathology, genetics and other pertinent reports.	