

Palm Beach State College
Course Syllabus – Hybrid/Web Content

General Class and Course Information

Course number: **BSC 2427L**

Class Reference Number: **152891**

Term: **Spring 2012**

Course title: **Biotechnology II Lab**

Credit/Contact hours: **2 credit hours; 6 contact hours/week**

Course Description:

This course provides a deep exploration of the basic foundations of molecular biotechnology, with emphasis on proteomics, which includes the study of protein structure, isolation, identification and purification. We will explore areas of immunobiological assays, which are relevant to biomedical biotechnology, particularly in the areas of applications of monoclonal and polyclonal antibodies and antigen detection assays. Cell and tissue culture technology and techniques will also be addressed. Mutagenesis and protein engineering, including fermentation and bioreactors, and protein separation, analysis and interactions will also be addressed.

Co-requisites: BSC 2427, CHM1046, CHM1046L

Pre-requisites: BSC2421L, BSC2420L, CHM1045 and CHM1045L

Course Learning Outcomes: As a result of taking this course, the student will be able to:

Course Core Objectives

Upon completion of this laboratory course a student should be able to:

1. Identify and apply the common safety precautions in a biotechnology laboratory.
2. Recognize and employ the standard aseptic and sterility techniques.
3. Gain an understanding of the properties of protein molecules.
4. Acquire basic technical skills in the handling, measurement, and manipulation of protein molecules.
5. Work in a tissue culture environment with confidence; thaw, subculture, and freeze cell lines.
6. Identify various proteins and antigens through various detection assays.
7. Purify proteins using liquid chromatographic techniques.
8. Separate protein mixtures through various column chromatography methods.
9. Quantify various proteins by different assays and interpret the data.
10. Carry-out protein electrophoresis and western blot analysis.

Course Core Outline

- I. Laboratory Safety in biotechnology.
- II. The growth curve experiment. Bacterial culture techniques.
- III. Introduction to tissue culture. Aseptic technique in the tissue culture environment.
- IV. Thaw, subculture and freeze cell Chinese hamster ovary (CHO) cells.
- V. Perform and interpret an Enzyme Linked Immuno Sorbent Assay (ELISA).
- VI. Separate and purify protein mixtures utilizing the principles of size exclusion column chromatography.
- VII. Protein analysis via vertical tris-urea Polyacrylamide gel electrophoresis (PAGE).
- VIII. Protein gel electrophoresis using SDS-PAGE.
- IX. Western Blot analysis. Use of primary and secondary antibodies.
- X. Protein quantification. BCA vs. Bradford Assay vs. NanoDrop 280.
- XI. Protein purification by FPLC (fast protein liquid chromatography).
- XII. Introduction to Bioreactors.
- XIII. Polymerase chain reaction (PCR).

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- XIV. Protein isolation and analysis from fruit.
- XV. Detection of proteins and protein activity via amylase activity assessment.
- XVI. Protein gel electrophoresis via Polyacrylamide gel electrophoresis (PAGE).
- XVII. Protein electrophoresis via SDS-PAGE.

Full Course Outline: Click on the following link:

http://www.palmbeachstate.edu/asp/IE_ShowOutline.asp?show=Y&CourseID=BSC2427L

Class Schedule: Class *will meet on Mondays & Wednesdays from 2:00 pm – 5:00 pm in SC214.*

Lab will meet twice a week for 6hrs each time and students are required to attend every session. Students are required to take all quizzes/exams related to the course and participate in all assignments. Students are required to come to class prepared for the lab experiment that will be conducted that day, and with their pre-labs completed. Students are expected to turn-in lab reports on the days they are due.

Textbook(s) Information: This course does not have a required textbook. All experiment protocols and necessary files/information can be found on the Blackboard course website.

Required Materials

- Spiral-bound Carbon-Copy Laboratory Notebook, 100 pages. (Available in PBCC bookstore). Hayden McNeil Specialty Products. ISBN: ISBN 978-1-930882-74-4. www.labnotebooks.net
- Lab coat and goggles (obtain from bookstore, Booksmart, medical supply store or uniform store)
- Calculator, Black pen, Ruler, Clear tape
- Access to a computer containing Microsoft Excel (or similar) with connection to a printer
- Materials for storing hand-outs
- Digital camera is strongly recommended but not required

Suggested Materials

- Seidman L.A., 2008, **Basic Laboratory Calculations for Biotechnology**, San Francisco, CA. Pearson Education, Inc. publishing as Pearson Benjamin Cummings, ISBN 10-digit: 0-13-223810-1. ISBN 13-digit: 978-0-13-223810-6. www.aw-bc.com

You may purchase your textbook(s) at any one of Palm Beach State College's campus bookstores or online at <http://www.efollett.com>.

Web Content Information: <https://palmbeachstate.blackboard.com/webct/entryPage.dowebct>

Professor's Contact Information

Professor's Name: Dr. Alexandra Gorgevska

Office Location: SC 209

Telephone: 561-207-5003

Email address: gorgevska@palmbeachstate.edu

Home Page: <http://www.palmbeachstate.edu/x461.xml?id=Gorgevska>

Office Hours:

Monday:	9:00 am – 10:00 am; 12:00 pm – 2:00 pm
Tuesday:	9:00 am – 10:00 am; 1:00 pm – 2:00 pm
Wednesday:	9:00 am – 10:00 am; 12:00 pm – 2:00 pm
Thursday:	9:00 am – 10:00 am; 1:00 pm – 2:00 pm

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Class Requirements

Assignments: This is a laboratory experiment-based course that will focus heavily on experimental detail, procedure, and write-up. Students can expect to write up a lab report every day. Students are expected to come to class with their pre-lab already written (Title, Purpose, Background, Materials, Procedure). Failure to do so will result in deduction of points from lab report. There will be periodic assignments during the semester that will be discussed in class and also made available on the course website. It is the student’s responsibility to do the assignments and turn them in on time.

Late Assignment Policy: All required assignments are expected to be completed on time. If, due to an emergency, a student cannot meet the due date, s/he is to request an extension from the professor. Documented evidence from a doctor/emergency room etc will be necessary for extension requests. Assignments turned in late will have points deducted from them. It is at the Professor’s discretion to either accept or deny a late assignment. If an assignment is accepted late, points will be deducted.

Grading Scale and Policy: The grading scale is based upon attendance, participation, lab reports, and exams. This means that participation and attendance makes a significant portion of the final grade. An accurate record of attendance will be kept for each course. If a student misses one-third or more of a class session (or “disappears” for long periods of time, the student will be counted absent. Three tardies will count as one absence. Leaving early is the same as being tardy. If a student is absent on the day of an exam/quiz/assignment/experiment, they will receive a grade of zero. It is the student’s responsibility to ensure all assignments are turned in on time. Due to the number of lab reports that will be generated, the total number of possible points is high, so the grade breakdown is given in overall percentages:

Grades

- Notebook & Results 40%
- Quizzes and Homework 10%
- Participation and Attendance 10%
- 2 exams 40%

Exam Formats

- Format is mostly paper short answer & problem-based; very few MC or T/F . No Scantron.
- Review session will be approximately 1 week prior to exam. Any assistance can be provided via email, course website, or your own study groups.

Grades will be calculated by the following scale:

	Percentage
A	90-100
B	80-89
C	70-79
D	60-69
F	≤ 59

***Tentative* Exam & Event Schedule**

All quizzes and exams will take place during the on-campus Laboratory Session in room SC 214.

- Midterm Exam: Wednesday, February 29th at 2:00 pm – 3:30 pm. Room SC 214.
- Tentative Field Trip Date: Monday, April 11th 2:00 pm – 5:00 pm. Location: TBD.
- Final Exam: Monday, April 23rd at 2:00 pm – 3:30 pm. Room SC 214.
- Poster Session: Monday, April 30th 1:00 pm – 3:00 pm. Room SC 127.

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Make-up Exam Policy: Make up tests/quizzes are only given in emergency situations. These exams may be in a different format than the original class exam. The student is responsible for the fee to take the proctored test in the Test Center. Special arrangements for make-up exams should be discussed with and approved by the professor. For any other situation, a grade of zero will be given for missed exams/quizzes. **There are absolutely NO make-up lab experiments.**

Distance Learning Class Information

This course is taken in part via the Internet (hybrid classes), or includes a web component. Before you decide to take the course under these conditions, it is recommended that you:

- take the following assessments to determine if distance learning is best for you:
 1. [Should I take a distance learning class?](#)
 2. [Do I have enough time to take a distance learning class?](#)
 3. [Do I have the technical skills and knowledge to learn online?](#)
- read the [Distance Learning Frequently Answered Questions](#) page which include instructions for logging onto Blackboard, computer requirements, and basic computer skills students must have prior to enrolling a distance learning class.
- Read the syllabus description below carefully.
- Contact the professor by e-mail or by phone if you have any questions.

Computer Requirements

If you choose to take this course, you must have access to a computer that meets the [basic computer requirements](#) - <http://www.palmbeachstate.edu/x10620.xml>

SLC Computer Lab

If students do not have access to a computer at home, the SLC Computer Lab at a Palm Beach State campus can be used to complete course assignments. Visit the SLC Computer Lab web page at <https://www.palmbeachstate.edu/x13669.xml> for location and hours.

IT IS RECOMMENDED THAT THE STUDENT TAKING THIS COURSE AS A *HYBRID COURSE* **NOT** BE A NOVICE COMPUTER USER. THE STUDENT SHOULD KNOW HOW TO USE A MOUSE, NAVIGATE THE INTERNET, AND SEND/RECEIVE E-MAIL WITH ATTACHMENTS. VISIT THE FOLLOWING WEB PAGE FOR MORE INFORMATION REGARDING MINIMUM COMPUTER SKILLS STUDENTS MUST HAVE PRIOR TO ENROLLING IN A HYBRID COURSE - <http://www.palmbeachstate.edu/x10620.xml>.

This course has an Internet web site located at: <https://palmbeachstate.blackboard.com>

The course web site will be available three days prior to the start of the semester. Your password will not work until that time. It is the student's responsibility to have accessed this site no later than **January 10, 2012**. The web site has a security system which requires a *Sign on* and a *Password*. Only registered students will be able to access the course. **Failure to access the Blackboard course website prior to midnight on that date will result in the student being dropped from the course.**

To login to the course web site:

Go to <https://palmbeachstate.blackboard.com> **User Name:** Use your Palm Beach State Student ID Number (no hyphens). Your Palm Beach State Student ID Number can be found on the back of your student ID card. If you do not have a student ID card, you can obtain one in the bookstore at Lake Worth campus. For obtaining a student ID card on other campuses, check with the campus directly. **Password:** The student's Blackboard password will be the student's Palm Beach State Pin Number.

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What do I do if I forget my password or need assistance with Blackboard?

E-mail the Blackboard administrator at adminwebct@palmbeachstate.edu. You can also contact the Palm Beach State Student Helpdesk by sending an e-mail to studenthelpdesk@palmbeachstate.edu or contacting them by phone at (561) 868-4000. Be sure you have the following information available:

- your full name
- your Palm Beach State Student ID number
- course with the reference number
- details of the assistance needed and any error messages
- The Student Help Desk Hours of Operation are posted on the following web page:
<http://www.palmbeachstate.edu/x6363.xml>.

On hours and days that the Help Desk is closed, the student may leave a voice message or an e-mail and the issue will be addressed the next business day.

Class Policies and Methodology

Attendance: Professors are required to take attendance. **Attendance to the first day of class is Mandatory. Failure to do so will result in the student being dropped from the course.** Students will be expected to obtain all necessary lab materials from the website and participate in course discussions on the website. Students are expected to post valid/relevant comments and participate in discussions related to course materials. Students are required to access the course website *at least two times per week* to read the required lab materials, check the discussion board and course email regularly. Students are expected to attend ALL class-related sections/events. 100% attendance and participation is expected.

Electronic Device Use: The use of cell phones or other electronic devices during class is prohibited. If a student is caught using any such device, they will be asked to leave.

Email Policy: The blackboard e-mail system is the official electronic communication from the Professor to all the students registered in this course, and from all the students to the Professor. The **students are considered officially informed** of any changes or special instructions or announcements through this system. The instructor's Blackboard e-mail address and discussion board will be checked once per day Monday to Thursday from 9:00 am – 6:00 pm. This means that weekends and holidays are not officially check days. The instructor will do their best to respond to all emails within 24 – 48 hrs, however, response time may vary due to holidays/weekends.

Equipment and Supplies:

- Lab coat and goggles (obtain from bookstore, medical supply store or uniform store)
- Calculator, Black pen, Ruler, Clear tape
- Access to a computer containing Microsoft Excel (or similar) with connection to a printer
- Materials for storing hand-outs
- Digital camera is strongly recommended but not required

Professor's Expectations: The student is expected to participate in 100% of the lectures and laboratories along with completion of all assignments, quizzes, and exams.

Methods of Instruction: Online web-component for distribution of laboratory materials along with communication and on-campus laboratory experiments. In-class laboratory experiments will be performed during the scheduled class time.

Unique Requirements of the Class: Following the online content of lab material, plus attendance and participation of the weekly lab sessions on campus, plus all exams/quizzes/assignments/course-related material.

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Ensuring Success

- Read and Understand this Syllabus
- Perfect attendance
- Completion of exercises/reading assigned to complete before class;
- Asking questions one of the most important skills you can learn in a college course. (Not the ones you may have to ask because you were not paying attention or didn't do the reading.)
 - Ask if I use a word you are not familiar with
 - Ask for me to explain why, or how, or when etc. when needed
 - Ask when you want a deeper understanding of a concept
- Use text book, library, provided CD-ROM, and internet extensively
- Ask for help if you are unsure about anything; many things in the lab are more expensive than you would believe; shyness is not an excuse
- Because of the nature of the course, there is virtually no way that everything you need to know can be written into class notes - pay attention and add extra notes of your own when necessary. (I will not test this extra-knowledge, though – it's just that, if you are serious about this career, you have to be able to 'pick up' on bits of trivia.)

Classroom Environment

- **Clean up after yourself-failure to do so will result in deduction of points from lab reports**
- Behaviors which will result in grade reduction
 - "Disappearing" from class for an extended time
 - Not keeping/leaving a clean work space
 - Negligence and/or abuse of equipment
 - Questions or actions that indicate you are not prepared
 - Non-participation
 - Disruptiveness (interfering with teaching and learning)
 - Academic dishonesty
 - Disrespectful behavior towards classmates/professor

Laboratory Safety Guidelines

1. Laboratory Manual (Daugherty, 2006) – You MUST read and familiarize yourself with the “Background” sections on pp. 4-5
2. You MUST be attentive to any additional guidelines and warnings given by the instructor.

Laboratory Notebook – Basic Guidelines for Legal Scientific Notebook

1. Use only ink; no pencil
2. Use a spiral-bound carbon copy notebook (press firmly because carbon copy doesn't always transfer well)
3. All pages numbered in ink before use (on upper, outside corner of page)
4. Page 1 for identification information
5. Pages 2-4 for Table of Contents
6. When filling only part of a page, you may cross through the empty space
7. **NEVER remove pages-under any circumstance**

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8. When photos or computer printouts must be inserted tape them in on all sides and sign/date over the edge-NEVER staple anything into the notebook
9. Do not use abbreviations, names or symbols that other people will not understand
10. Be honest – even mistakes must be recorded.
11. NEVER use “white-out” correction fluid or “blacking out”; incorrect entries may be lined out with a single line only and must be labeled with initials and the date. NEVER cover-up data in the notebook.

Correct: ~~Mistakes~~^{ag 1/8/07}

Incorrect: ~~Mistakes~~

12. Write data generated during the experiment directly into notebook. Do NOT keep scrap papers that can be misplaced or jumbled out of order. There are **NO ROUGH DRAFTS**. All data must be entered directly into the lab notebook.
13. “Your” notebook is typically the property of your employer; in a workplace setting it should never be taken home. Expect others to read it and therefore write your reports as though they are directions for someone else. BE DETAILED!!
14. Each day, sign and date at the bottom of each page that you use. Have a “witness” sign and date as well.
 - This IS done in industry. Your witness will usually be someone not working with you on the same experiment, but who can attest you were performing the experiment on the days you specify
15. For each experiment/project, your notebook entries should include: Title, Purpose, Materials Needed, Methods/Protocol, Results, Discussion/Conclusions, References, “Thinking Like a Biotechnician” questions (when applicable). More details will be given in class.
16. For each experiment, you are required to have a pre-lab completed before you come to class that day. The pre-lab consists of Title, Purpose, Background, Materials, and Protocol. Failure to have this completed will result in deduction of points from lab report grade. Leave some room for notes/changes to the experiment. Also leave room for the Data, Results, Conclusion, and any “Thinking Like a Biotechnician” questions (when applicable).

College Policies and Web Information

Academic Dishonesty

Academic dishonesty includes the following actions, as well as other similar conduct aimed at making false representation with respect to the student's academic performance:

- (1) Cheating on an exam,
- (2) Collaborating with others on work to be presented, if contrary to the stated rules of the course,
- (3) Submitting, if contrary to the rules of the course, work previously submitted in another course,
- (4) Knowingly and intentionally assisting another student in any of the above actions, including assistance in an arrangement whereby work, classroom performance, examination, or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed,
- (5) Plagiarism.

Please refer to the **Palm Beach State College Student Handbook**

(www.palmbeachstate.edu/Documents/Marketing/studenthandbook.pdf) for further information.

Classroom Etiquette and Student Behavior Guidelines

Students will demonstrate respect for professors and fellow students. Behavior that is disruptive to a positive learning environment reported by the professor will result in a warning on the first instance; the second instance might result in expulsion from the course or campus.

Computer Competency Component

Each student will, to the satisfaction of the professor, demonstrate a fundamental understanding of basic computer operations through various professor-determined exercises and/or assignments.

Disability Support Services

Students with disabilities are advised, in compliance with federal and state laws, that accommodations and services are available through the office of Disability Support Services (DSS). It is the student's responsibility to contact Disabled Student Services Advisors

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and to submit appropriate documentation prior to receiving services. Please see the website at www.palmbeachstate.edu/disabilities.xml.

Eating, Drinking and Smoking

Eating and drinking are confined to areas designated on the campus. Smoking is not permitted in any College building and only in areas designated at each campus.

Student Responsibility Policy

When a student attends the College, s/he becomes subject to its jurisdiction. Students are expected to conduct themselves in a responsible manner, in all areas of campus life. By enrolling, they pledge to obey the rules and regulations of the College and are responsible for observing all College policies and procedures as published in the student handbook, the College catalog and other College publications. The student will be responsible for preparing for class, participating in class, and completing assignments on time.

Palm Beach State Websites of Interest

Please see this web page (www.palmbeachstate.edu/x340.xml) for a list of web addresses for students.

Withdrawal Policy for Individual Courses

The last day to withdraw from a College course with a "W" grade in this course is **March 27, 2012**. It is the responsibility of the student to use the PantherWeb system or visit a campus Registrar's office to withdraw. An official withdrawal entitles the student to a grade of "W" in the class.

Department Contact Information

Department Contact Name: Dr. Libby Handel
Office Location: SC 205
Telephone: 561-207-5059
Fax Number: 561-207-5048
Email address: handele@palmbeachstate.edu

Getting Started with a Web Class

1. Make sure you have all the computer system requirements as listed in the Computer Requirements section of this syllabus.
2. E-Mail the professor gorgevsa@palmbeachstate.edu with your name and phone number. The professor will communicate with you through Blackboard or your Palm beach State-issued email address.
3. Obtain course materials. The textbook(s) can be purchased at the Palm Beach State campus bookstore or online at <http://www.efollett.com>.
4. Log onto the course web site at: <https://palmbeachstate.blackboard.com> Use your **Pantherweb** logon information.
5. Once inside the course website, read the "Mandatory Online Orientation" and complete the *Orientation Quiz*.
6. Explore the different parts of the web page. Be sure to print the **syllabus, course calendar, and assignment sheet** so that you know what is expected of you during the semester.
7. Read the instructor's *Welcome* message on the discussion board and post a reply to it introducing yourself to the class.
8. Begin completing your assignments as listed on the course calendar.

Have fun!

<u>Lab Period</u>	<u>Experiment</u>	<u>Homework/ Reading Assignment</u>
1 01/09/12	<p>Introduction to Laboratory. Policies on grading, and attendance will be provided. Safety rules including for waste disposal and use of lab-coats, safety glasses, eye-wash, and shower will be provided. Lab Report format and expectations will be discussed.</p> <p>Discuss and Prep for Experiment #1: E. coli Growth Curve.</p>	Syllabus.
2 01/11	<p>The Growth Curve Experiment. Students will learn how to prepare and autoclave nutrient broth along with how to prepare agar plates. Initiate <i>E. coli</i> colony growth.</p> <p>Day 1: Prepare & Autoclave LB Agar & LB Broth. Set-up broth for <i>E. coli</i> incubation. Inoculate broth then take periodic aliquots for analysis.</p>	<p>Media Prep for <i>E. coli</i> Growth Culture video (6 minutes long)</p> <p>The Growth Curve Handout (Day 1)</p>
01/16	MLK Day –Campus Closed. No Classes.	
3 01/18	<p>The Growth Curve (cont'd). Document observations of <i>E. coli</i> growth on agar media.</p> <p>Day 2: Pour Agar plates. Take O.D. measurements. Make dilutions. Plate <i>E. coli</i>. Incubate overnight @ 37°C in shaking incubator.</p>	The Growth Curve Handout (Day 2)
4 01/23	<p>The Growth Curve (cont'd). Day 3: Analysis of Results of <i>E. coli</i> growth on agar media. Colony counting. Calculation of real cell numbers at each time point.</p>	The Growth Curve Handout (Day 3)
5 01/25	<p><u>Possible QUIZ #1: The Growth Curve</u></p> <p>ELISA Antigen Detection Assay. ELISA is a useful detection assay utilized in immunology research to detect antibodies for certain proteins. It can also be used for drug testing, pregnancy tests, and outbreak studies. Students will carry-out antigen detection using unknown samples to test for antigen presence. They will compare their results to positive and negative controls.</p>	BioRad Biotechnology Explorer ELISA Immuno Explorer Student Instruction Manual
6 01/30	<p><u>Possible QUIZ #2: ELISA</u></p> <p>Size Exclusion Column Chromatography. Protein mixtures can be separated and purified through a variety of ways. One method is to</p>	BioRad Size Exclusion Chromatography Student Instruction Manual

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	utilize the size of the proteins to separate a heterologous mixture. Various protein mixtures will be given to the students and they will be required to separate the mixtures utilizing the principles of SEC into different fractions. The proteins will be saved and verified by PAGE.	
7 02/01	<p><u>Possible QUIZ #3: SEC</u></p> <p>Ion Exchange Chromatography. The most popular method for the purification of proteins and other charged molecules is ion exchange chromatography. In cation exchange chromatography positively charged molecules are attracted to a negatively charged solid support. Conversely, in anion exchange chromatography, negatively charged molecules are attracted to a positively charged solid support.</p>	Ion Exchange Chromatography Student Instruction Manual
8 02/06	<p><u>Possible QUIZ #4: IEC</u></p> <p>Protein Quantification. BCA vs. Bradford Assay vs. NanoDrop 280. Students will learn the principles and techniques involved in various protein quantification methods and perform a comparison between 3 different methods. The class will create concentration curves and learn how to analyze data.</p> <p>Today: Bradford Assay</p>	Protocol Handouts: BCA, Bradford, NanoDrop
9 02/08	<p>Protein Quantification. BCA vs. Bradford Assay vs. NanoDrop 280 (cont'd). Students will learn the principles and techniques involved in various protein quantification methods and perform a comparison between 3 different methods. The class will create concentration curves and learn how to analyze data.</p> <p>Today: BCA Method</p>	
10 02/13	<p>Protein Quantification. BCA vs. Bradford Assay vs. NanoDrop 280 (cont'd). Students will learn the principles and techniques involved in various protein quantification methods and perform a comparison between 3 different methods. The class will create concentration curves and learn how to analyze data.</p> <p>Today: NanoDrop Method</p>	
11 02/15	<p><u>Possible QUIZ #5: Protein Quantification Methods</u></p> <p>Vertical Gel Electrophoresis. Students will utilize the samples they isolated during the SEC & IEC assays. The class will learn the principles and techniques of PAGE and how to prepare reagents and protein samples for PAGE analysis. They will load and run the PAGE gels today. They will prepare and use a gel fixative solution on the</p>	<p>Handout on Electrophoresis</p> <p>Fixative Solution Protocol is on the Coomassie Stain</p>

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	completed gels. The gels will be stored @ RT in solution until next class.	Bottle.
12 02/20	Vertical Gel Electrophoresis (cont'd). Today, the students will use the gels that were "fixed" and carry-out a Coomassie gel stain in order to visual the protein bands and determine the MW of each protein in each fraction/wash.	Coomassie Stain Procedure is on the bottle.
13 02/22	<u>Possible QUIZ #6: Vertical Gel Electrophoresis</u> Midterm Exam Review & Lab Catch-Up Day. Repeat PAGE, if necessary.	HOMWORK: BioRad Protein Profiler Both Student Pre-Lab Activities p.52-59 of manual
14 02/27	Protein Analysis by SDS-PAGE in Preparation for Western Blot. Students will use SDS-PAGE (sodium dodecylsulfate-polyacrylamide gel electrophoresis) to separate and analyze the protein profiles of the muscle tissue of different fish species. By comparing the protein profiles of different fish species, they test the hypothesis that protein profiles are indicators of genetic and evolutionary relatedness. Day 1: Module 1 Lesson 1 Protein Extraction from Muscle (using a variety of fish samples) & Intro to SDS-PAGE Background. Extract Fish Muscle Proteins and distribute a negative charge in preparation for SDS-PAGE.	PDF Files: SDS-PAGE Background BioRad Protein Profiler Module I - Lesson 1 *Make sure to complete all Lesson Questions with lab report.
15 02/29	MIDTERM EXAM	
16. 03/05-03/09	Spring Break. Campus Closed. No Classes.	
17 03/12	Protein Analysis by SDS-PAGE in Preparation for Western Blot (cont'd). Module 1 Lesson 2: Electrophoresis: Gel Loading, Running and Staining. Separate the proteins according to their MWs using SDS-PAGE (this will generate protein profiles for each fish species). Note: We will not dry the gels (Lesson 3). However, plan to complete the Post-Lab Activity: Analysis and Interpretation of Results, p. 74-81.	BioRad Protein Profiler Module I - Lesson 2 *Make sure to complete all Lesson Questions with lab report.
18 03/14	Protein Analysis Part II, Western Blot Module. Western blotting employs antibodies to pinpoint specific proteins of interest in complex protein mixtures such as cell extracts. It is used to determine the presence of specific proteins, to quantify their expression levels and to determine whether they have undergone genetic or posttranslational modifications. This surefire method categorically identifies proteins of interest based on two distinguishing features: molecular mass and antibody binding specificity. Students will use this kit to specifically identify myosin light chain from the hundreds of other proteins that comprise the muscle cell extracts	PDF Files: BioRad Protein Profiler Module II – Lesson 1 Western Blot "sandwich" diagram & background info

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	of closely and distantly related species of fish. Lesson 1: Protein Extraction from Muscle (repeat of Module 1 Lesson 1)	*Make sure to complete all Lesson Questions with lab report.
19 03/19	Protein Analysis Part II, Western Blot Module (cont'd). Protein Profiler Module II- Lesson 2 Protein SDS-PAGE	Module II - Lesson 2 *Make sure to complete all Lesson Questions with lab report.
20 03/21	Protein Analysis Part II, Western Blot Module (cont'd). Protein Profiler Module II- Lesson 3 Perform Western Blotting. Store membranes in blocking solution (mentioned in lesson 4, step 4.3 of protocol) at room temp. until next class.	Module II - Lesson 3 *Make sure to complete all Lesson Questions with lab report.
21 03/26	Protein Analysis Part II, Western Blot Module (cont'd). Protein Profiler Module II- Lesson 4: Immunodetection for Myosin Light Chains.	Module II – Lesson 4 *Make sure to complete all Lesson Questions with lab report.
22 03/28	<u>Possible QUIZ #7: SDS-PAGE & Western Blot</u> Plant Protein Extraction from Live Plant Source (<i>Arabidopsis thaliana</i>) Small flowering plant that is widely used as a model organism in plant biology. Arabidopsis is a member of the mustard (<i>Brassicaceae</i>) family, which includes cultivated species such as cabbage and radish. Although not of major agronomic significance, Arabidopsis offers important advantages for basic research in genetics and molecular biology: <ul style="list-style-type: none"> • Approximately 115 Mb of the 125 Mb genome has been sequenced and annotated (Nature, 408:796-815; 2000). • Extensive genetic and physical maps of all 5 chromosomes are available. • The life cycle is short--about 6 weeks from germination to seed maturation. • Seed production is prolific and the plant is easily cultivated in restricted space. • Transformation is efficient utilizing <i>Agrobacterium tumefaciens</i>. • A large number of mutant lines and genomic resources is available. • <i>A. thaliana</i> is studied by a multinational research community in academia, government and industry. <p>Such advantages have made Arabidopsis a model organism for studies of the cellular and molecular biology of flowering plants. The Arabidopsis Information Resource (TAIR) collects and makes available the information arising from these efforts.</p> <p>For more information about this organism and the resources that have been developed for use by the community, please visit this website: http://www.arabidopsis.org/.</p>	Pierce P-PER® Plant Protein Extraction Kit Protocol
23	Downstream Processing: Plant Protein Quantification and Analysis BCA Reducing Compatible Protein Quantification Assay & SDS-PAGE Analysis	

Palm Beach State College
Course Syllabus – Hybrid/Web Content

04/02		
24 04/04	<p>Work on Lab Posters.</p> <p>Downstream Processing: Plant Protein Quantification and Analysis BCA Reducing Compatible Protein Quantification Assay & SDS-PAGE Analysis – Coomassie Stain Gels.</p>	
25 04/09	<p>Work on Lab Posters.</p> <p>*Lab Catch-Up Day.</p>	
26 04/11	<p>*Tentative Date* - Class Field Trip.</p>	Field Trip Flyer
27 04/16	<p>Biotech Awareness Week Activity</p>	
28 04/18	<p>*Finalize Posters Today.</p> <p>Final Exam Review</p>	
29 04/23	<p><u>Final Exam</u></p> <p>NOTE: POSTERS MUST BE SENT TO THE Designated PRINTSHOP BY TODAY At the absolute latest. You must obtain final approval from the instructor before sending the poster to the print shop.</p> <p>FastSigns http://www.fastsigns.com/535 4619 Okeechobee Blvd Ste 104 West Palm Beach, Florida 33417 United States phone: (561)616-3590 fax: (561)616-3591 email: 535@fastsigns.com Info to include when submitting poster: Bill to PBSC Dept of Biotech.</p>	
30 04/30	<p>Mandatory Poster Session. <u>(Final Grades will not be recorded until after satisfactory poster session participation has taken place.)</u> Your poster will be worth 2 lab report grades.</p>	1:00 pm – 3:00 pm. SC127.