

Palm Beach State College

Spring 2012

INTRODUCTION TO BIOTECHNOLOGY LAB (BSC2421L)
Intro to Biotech Lab—A Course Syllabus: Hybrid/Web Content

General Class and Course Information

COURSE NUMBER	BSC2421L	Intro to Biotechnology Lab
CLASS REFERENCE NUMBER		Section 152887
HOOR	Tuesday and Thursday, 10:00 am to 1:00 pm	ROOM SC214
CREDITS	2 semester credit hours with 6 contact hours per week	

COURSE DESCRITION This laboratory course provides hands-on experience for basic and common biotechnology laboratory techniques in the areas of laboratory safety, aseptic techniques, measurements and calculations, preparations of solutions, use of pH meters, spectrophotometers, centrifuges, *etc.* This training will also include specific biotechnology techniques, including DNA extraction and amplification, gene cloning, nucleic acid and protein isolation, purification and identification.

COREQUISITE **BSC2421** Introduction to Biotechnology (Lecture)

COURSE LEARNING OUTCOMES (Please see next page)

FULL COUSE OULINE There is a separate document detailing the Spring Semester 2012 Intro. to Biotechnology Lab, BSC2421L class. This document includes the following additional information: **a Course outline, Course Strategies, a Course Schedule (in a calendar format), Suggestions, and Tips to Guarantee Student Success. This Course Outline can be found at the following link:**
<http://www.palmbeachstate.edu/asp/IE>ShowOutline.asp?show=Y&Course ID=BSC2421L>

TEXTBOOK INFORMATION

Biotechnology: Science for the New Millennium Laboratory Manual, E. Daugherty, E. (2007), First Ed., Paradigm Publishing: St. Paul, MN. ISBN: 0-7638-2901-1.

Laboratory Notebook, (Carbon copy, spiral bound, 100 pages). Hayden McNeil Specialty Prod. ISBN 978-1-930882-74-4. www.labnotebooks.net

Suggested Text: Basics Laboratory Calculations for Biotechnology. Siedman, L.A. (2008). Pearson Benjamin Cummings, Inc.: San Francisco. ISBN 0-13-223810-1. Textbooks are available at the Palm Beach State College bookstore or online at <http://www.efollett.com>

ADDITIONAL REQUIRED MATERIALS

1) **Lab coat** and 2) **goggles**, 3) **hand-held calculator**, 4) **black pen**, 5) **ruler**, 6) **binder** or **folder** for storing handouts, access to a 7) **computer** with **Microsoft Word** and **Excel**

Disclaimer This syllabus represents a guideline that may be changed according to class need or scheduling. Changes to the syllabus will be discussed with the students in advance. **It is the responsibility of the student to make any adjustments as announced.**

COURSE LEARNING OUTCOMES

By the end of this course students are expected to have the following skills:

Course Level Student Learning Outcomes	Assessment Methods
<p>1. Calculate and measure different compounds and reagents based on the metric or SI (<i>Système International d'unités</i>) system, as well as dispense liquids using digital pipetors. Prepare lab solutions, including normal and molar, weight by volume, volume by volume and percent solutions, as well as different buffers.</p>	<p>Assignments require the preparation of various solutions and buffers using different systems of concentration (<i>M, N, w/t, v/v, %</i>). In class success and lab reports will be used to assess how well the material was mastered.</p>
<p>2. Recognize and employ the standard aseptic and sterility techniques. Use bacterial techniques including bacterial counting, sterile transfer, staining bacteria, and handling bacterial media and cultures. Manipulate eukaryotic (plant and animal) tissues.</p>	<p>Laboratory assignments and case studies presented in class will measure the student's understanding of prokaryotic and eukaryotic cell manipulation in culture. Quiz questions will consider the handling, storage and use of GMO's.</p>
<p>3. Extract and obtain DNA from a variety of sources by standard techniques. Utilize the polymerase chain reaction (PCR) to amplify DNA. Perform gene cloning using bacterial transformation and selection of transformants by antibiotic resistance. Explain the risks and benefits of genetically modified organisms (GMO's).</p>	<p>One midterm, three quizzes and the final exam will be used to assess a student's understanding of DNA isolation, purification, amplification. Laboratory discussions will consider ethical issues involving the use of biotechnology and genetically modified organisms (GMO's).</p>
<p>4. Identify colonies of bacteria containing a recombinant plasmid by agarose gel electrophoresis and examine inserts and orientation by restriction-endonuclease fingerprinting. Measure transgene expression by SDS-polyacrylamide gel electrophoresis. Perform protein isolation, identification and analysis.</p>	<p>The midterm and final exam will contain a number of short essay questions considering the scheme used to transform and select cells containing exogenous DNA. The final will also contain questions that consider gene expression and protein purification.</p>
<p>5. Identify and apply the common safety precautions, including safety issues and risks, involved with laboratory work. Describe various procedures used to protect the student against spillage, breaking or contamination in the laboratory. Maintain a correct laboratory notebook as a record of precise lab procedures and safety precautions taken.</p>	<p>Laboratory discussions and exam questions will consider the correct use of chemicals, biological, and glassware in the lab. Safety concerns will be presented in lab and description of the correct procedures will be part of the final exam.</p>

Palm Beach State College

Intro Biotechnology Lab

Spring 2012

Professor Contact Information

PROFESSOR Dr. Raymond S. Pacovsky
OFFICE SC248 Palm Beach Gardens (Eissey) Campus
TELEPHONE NUMBER 561-207-5048 **FAX NUMBER** 561-207-5248
COURSE E MAIL pacovskr@palmbeachstate.edu
PERSONAL E MAIL bioray.pbsc@gmail.com (only if PBSC e mail is not working)
HOME PAGE <http://www.palmbeachstate.edu/x461.xml?id=PACOVSKR>
OFFICE HOURS Tuesday and Thursday 9:00 to 10:00 a.m.
 and Tuesday 3:30 to 4:30 p.m.
OPTIONAL OFFICE HOURS Monday and Wednesday 9:30 to 10:30 a.m.
ADDITIONAL HOURS By appointment. Drop-Ins are also **welcome and encouraged**.

Class Requirements**ASSIGNMENTS**

1. Weekly lab reports are required. This is a laboratory experiment-based course that will focus heavily on experimental detail, procedure and write-up. Before each laboratory, students will have written a **pre-lab (Title, Objective, Introduction, and Procedure)**. Failure to do so will result in a loss of **20 points**. Following the lab, the **Results** (in detail, including an **Analysis**), **Discussion** (insights, sources of errors, difficulties, suggestions) and **Conclusion** (usually one or two sentences) will be written up and turned in.

2. Periodic Homework Assignments. During the semester, following classroom presentation of how to make measurements, calculate concentrations and perform scientific procedures, assignments from the lab text will be given with a specific due date.

LATE REPORT POLICY A laboratory exercise that is performed one week is due the beginning of the lab meeting the very next week. These reports will then be graded and returned to the student the following week (two weeks after the lab had been performed).

Lab reports MAY be turned in one week late (before the corrected lab reports have been returned to the class), but **LATE lab reports will lose 20% of total points**. Lab reports that are **more than two weeks late will NOT be accepted** since corrected lab reports have been returned to the class, and any student attempting to turn in a report more than two weeks late may have simply copied from another student.

There may be certain circumstances (principally an extended illness) when a student will be allowed to make-up a lab that was missed, but the make-up lab will be significantly different from the original assignment and copying from fellow students will not be an option.

GRADING SCALE AND POLICY **Total number of points and breakdown** There will be approximately **3600 points awarded** in this class. Lab write ups will account for **58%** (2100 points), three lab quizzes/three exams (900 points) will be worth **25%**, and homework assignments (200 points) will be worth 6% of your final grade. Notebooks (200 points) and class participation (200 points) count for the **15%** of your overall final grade.

Grades will be based on **RANK** using the total number of points obtained. Students will be ranked according to the number of points they earn. The top 25-30% of the class earns A's, the next 45% of the class earns B's, and the last 25-30% of the class will earn C's, D's, or F's, depending on the percentage of points earned. Adjustments can be made based on class performance: if many students earn high total point percentiles, a greater proportion of A's WILL be awarded.

Approximately every three weeks there will be a 100 point quiz or a 200 point exam. There may be random assessments to supplement quiz and test grades if the class is having difficulty with the material. **Exams are constructed so that students have a choice of the questions that they answer.** Ample time is given for assessments. If a student finishes the chosen questions, the excluded question(s) may be answered for extra credit. **The maximum extra credit that a student can receive is capped at 10% of the total points on a given exam quiz or final.**

Time duration for exams The final exam will be on Tuesday, May 1 takes 2 hours and is worth 200 points (6% of grade). Two exams (an hour and 20 minutes each) will be given, 200 points each (12% of grade combined), on Tuesday, February 14 and March 27. There will be three quizzes (40 minutes each), 100 points each, given on January 31, March 1 and April 12 (8% of grade combined).

TESTS, QUIZZES AND FINAL EXAM SCHEDULE

Quiz 1: January 31

Exam 1: February 14

Quiz 2: March 1

Exam 2: March 27

Quiz 3: April 12

Final: May 1

MAKE-UP EXAM POLICY I have a **generous policy** towards make-up exams. If an exam is missed due to a **valid excuse**, students have up to one week to take a make-up exam with **no penalty**. More than one week late, an additional 20% of points will be subtracted from the total points. Exams more than three weeks later are normally NOT allowed. Students who do not attempt an exam will be awarded zero points. If, due to a serious unforeseen emergency, a student NEVER is able to make up an exam, at best, a grade of Incomplete (I) can be recorded for the student. If a student chooses to take an Incomplete, **please contact me as early as possible** so as to review PBSC's policies regarding the deadlines and the manner in which the Incomplete can later be removed.

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:
 1. Instructions for logging onto Blackboard
 2. Computer requirements
 3. 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 **August 25, 2011**. 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 or on other campuses (check with the campus directly). **Password:** The student's Blackboard password is the student's Palm Beach State Pin Number.

Class Policy and Methodology

LEARNING COMMITMENT This course meets **6.0 hours per week**. In most U.S. colleges and universities, there is a “two for one” rule that states “for every hour a student is in class there should be two hours of out-of-class preparation (studying, reading the text, research, writing reports or papers).” This class requires the same time commitment from you, the student. **You must have and must use an active e mail address ending in [@my.palmbeachstate.edu](mailto:my.palmbeachstate.edu)** since this is how we communicate.

LEARNING COMMITMENT: RECOMMENDATIONS:

Since we cover a lot of material rapidly, the following steps are highly recommended:

- 1) **Form small study groups** that meet on a regular basis;
- 2) **Read the lab instructions** before coming to the laboratory;
- 3) **Get tutoring** if you need it; before reading a chapter, scan the material;
- 4) **Prepare lab reports promptly**; do not leave for the last minute;

ATTENDANCE Class attendance and involvement in class activities is worth **150 points** of a student's grade (4.2% of total). Attendance is taken by passing around a sign in sheet so that students will indicate their presence. Students are responsible for signing in each class period, and they are expected to **individually** sign the attendance roster.

A student may miss **three class periods** without any penalty, but upon the **fourth absence**, and every absence thereafter, the student loses class participation points. Starting with the fourth absence, **40 points** (1% of a student's total grade) is lost. This continues until all 4.2% is lost. Following the **seventh absence**, a student will be at risk of being **dropped from the class**.

TARDY If you are **15 minutes** or more tardy to class, it will be counted as an **ABSENCE**. Even if you sign the class attendance sheet, I will amend it to show NO ATTENDANCE with an annotation that you were tardy by a specific number of minutes.

ELECTRONIC DEVICE USE All electronic devices such as cell phones, beepers, pagers, and related devices are to be turned off before entering the classroom, library, and laboratories to avoid disruption. **Use of any device in these areas is a violation of college policy and subject to disciplinary action.** If you text in class, your **cell phone will be taken** and returned later.

College computers are intended for academic work. **Inappropriate use of computers during class time is prohibited.** You should understand that you may be required to use the Internet for some courses. Furthermore, you may be required to have discussions of class assignments and share papers and other class materials with instructors and classmates. Therefore, Internet users may be able to access your work whether the access is secured or unsecured. Unfortunately, the College **cannot protect you** from the type of materials on the Internet or the potential piracy of your materials.

E MAIL POLICY You must have a working [@my.palmbeachstate.edu](mailto:my.palmbeachstate.edu) account for this class. **This is without exception.** Students can enter into contact with the professor by e mail, but students should not expect an immediate reply. I check my e mail NO MORE THAN once a day, and occasionally you may have to wait two days for a reply. I will send you a few supplemental materials by e mail (electronic handouts) which are NOT essential to the class but may assist you in learning the material.

PROFESSOR'S EXPECTATIONS Each and every student is expected to do his or her very best and succeed in this class. Not only do I expect you to master the content material presented, but I expect that you will increase your reasoning abilities, think more critically and understand the ethical concerns of those working in the field of biotechnology.

PROFESSOR'S PHILOSOPHY I am committed to student success. I have made time for office hours, will provide supplementary materials, allow assignments to be turned in late, permit make-up exams and I will work with each and every one of you to make certain that you do your best. **My mission is to get you to EXCELL in this course.** Labs will be organized so that they remain accessible to struggling students, but they will also be challenging to those students who are highly motivated.

METHOD OF INSTRUCTION Most of the material will be presented using lab assignments and class activities in a Socratic teaching style. To get the most from this course, it will be best if you take the Intro to Biotechnology class (BSC2421) concurrently. The theoretical, lecture-based course gives a rigorous background that complements the lab course (BSC2421L).

LABORATORY AND CLASSROOM ENVIRONMENT

In any laboratory environment there are toxic, caustic and flammable chemicals, glassware that can break and sensitive scientific instruments. A student's behavior will not be allowed to endanger themselves, the instructor or any other student. Disruptive behavior and the negligence or abuse of lab equipment can result in your expulsion from the classroom, and if the action is repeated, your removal from the course. A student who fails to clean up his or her workspace will lose points from their lab write up.

Laboratory Safety Guidelines Please read the **Background section of the Laboratory Manual** (Daugherty, 2006), pages 4 and 5 to familiarize yourself with safety procedures before entering the lab. Additional warnings, guidelines and lab policies will be presented by the Instructor which you will need to observe.

Laboratory Notebook The **Basic Guidelines for a Legal Scientific Notebook** is presented in a handout and will be discussed in class as it relates to ethics in science.

College Policies

ACADEMIC DISHONESTY Palm Beach State College has an Academic Dishonesty policy. It is your responsibility to be familiar with the policies, rules, and the consequences of violations. **There is no tolerance for cheating and academic dishonesty.**

Discipline can range from a zero on a specific assignment to expulsion from the class with a grade of F. Note that copy/pasting published information, whether it's from your textbook or the Internet, without citing your source is plagiarism and violates this policy. Even if you change the words slightly, the ideas are someone else's so **you still have to cite your sources.**

You may work on a lab report with your partner or another student in the class, but your Discussion and your Conclusion section **MUST BE** different from that of other students.

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

Students **will not be allowed** to leave the room without asking permission. If you exit the classroom without permission, **you will lose 20% of your class participation grade each time** you leave the classroom without permission.

Eating and drinking will be confined to specific areas on campus. Smoking is NOT PERMITTED in any of the College buildings. Smoking is permitted ONLY in the designated Parking areas.

In many job environments, courtesy is expected. I expect you to use "Please," and "Thank you", "Excuse me", and "You are welcome" in your conversations with me and your classmates.

COMPUTER COMPETENCY Each student will, to the satisfaction of the professor, demonstrate a fundamental understanding of basic computer operations through professor-determined exercises and assignments. Labs may be written up by hand or typed.

DISABILITY SUPPORT SERVICES If you wish to request accommodations as a student with a **documented** disability please make an appointment with the Learning Specialist on campus. If you will need assistance during an emergency classroom evacuation, please contact your campus learning specialist immediately about arrangements for your safety. Their e mail is:
<http://www.palmbeachstate.edu/disabilities.xml>.

STUDENT RESPONSIBILITIES When a student attends the College, he or she 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 themselves 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 the assignments on time.

Disclaimer These policies, protocols and course details may be changed according to alterations of schedule or College policies. Changes in dates, course details or College policies will be discussed with the students in advance. It is the **responsibility of the student** to make any adjustments as announced.

Palm Beach State WEBSITES OF INTEREST

Advising	http://www.palmbeachstate.edu/advising.xml
Panther Web/Registration	http://www.palmbeachstate.edu/pantherweb.xml
Programs of Study	http://www.palmbeachstate.edu/programs.xml
SLC/VPI	http://www.palmbeachstate.edu/slc.xml
Student Services	http://www.palmbeachstate.edu/studentservices.xml

DEPARTMENT CONTACT INFORMATION

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October 2011

RSP

R. S. Pacovsky, PhD

GENERAL COURSE SCHEDULE

Topics

1. **Introduction; The Laboratory:** Syllabus, Grading, Lab Organization, Responsibilities, Lab Safety, Waste Disposal Lab Write-Ups (**Jan. 5**)
 2. **Aseptic Technique:** Proper handling of materials, Sterilization, Surface Disinfection, Gloves/Gowns, Proper use of Equipment (**Jan. 10**) **Exp. 1**
 3. **Making Measurements:** The International Metric System, Prefixes and Units: Mass and Volumes, Use of analytical balances, Accuracy and Precision (**Jan. 12**) **Exp. 2**
 4. **Accuracy and Precision:** Using the Analytical Balances (**Jan. 17**) **Exp. 3**
Work on **Assignment 1: Measures and Units**
 5. **Spectrophotometry and Solutions:** Basic operation of the spectrophotometer, concentration units used for various solutions, considerations (**Jan. 19**) **Exp. 4**
Assignment 1: Due
 6. **Molarity (M), Normality (N), and unit conversions:** Theoretical considerations, calculations, ways to represent terms, comparison with w/v, v/v and % (**Jan. 24**) **Exp. 5**
Work on **Assignment 2: Molarity, Normality and Concentrations**
 7. **Dilutions and unit conversions:** Sample calculations, Assignments are due, preparation and Review for Quiz 1 (**Jan. 26**) **Exp. 6**
Work on **Assignment 3: Concentrations and Dilution (due Jan. 31)**
Assignment 2 and 3: Due; Additional Review in preparation for quiz (**Jan. 26**)
- Quiz 1: Volumes (Pipetting), Solutions and Concentrations (Jan. 31)**
8. **Acids and Bases: The pH Scale:** Salts, Cations and Anions, Acids (H^+) and Bases (OH^-), Neutralization Reactions, Titrations, The pH scale (**Jan. 31**) **Exp. 7**
 9. **Eukaryotic DNA Isolation and Analysis:** Isolation of Strawberry DNA, Colloid Instability and Precipitation, Solution Preparation (**Feb. 2**) **Exp. 8**
 10. **Agarose Gel Electrophoresis:** Understanding Electrophoresis: Agarose gels, Nucleic acid Mobility and Resolution, Anode/Cathode, Electrolysis, Fragment sizes (**Feb. 7**) **Exp. 9**
 11. **DNA Visualization; Bacterial DNA Isolation:** Isolation of *E. coli* chromosomal DNA, Proper Handling and Storage of DNA, Visualizing DNA (**Feb. 9**) **Exp. 8 (cont.)**
- Midterm 1: DNA Isolation and Concentration Measurements (Feb. 14)**
12. **DNA Concentration Measurements:** Methods to Measure DNA Concentration (Ultraviolet Light, Nanodrop, EthBr fluorescence), Calculations (**Feb. 14**) **Exp. 9 (cont.)**
 13. **Estimating Molecular Weights in Agarose Gels:** DNA Mobility and MW markers, Standard Curve and non-linear DNA mobility based on pore size, Pulsed-Fields (**Feb. 16**) **Exp. 10**
 14. **DNA Analysis: Quantitative and Qualitative DNA analysis:** Units, Concentrations and Amounts; DNA mobility and MW, Nucleic acid Type (**Feb. 21**) **Exp. 10 (cont.)**
 15. **Media Preparation and Aseptic Technique:** Considerations regarding Sterility, Aseptic Techniques, Disinfection, Contamination Control, and Bacterial Stocks (**Feb. 23**) **Exp. 11**

GENERAL COURSE SCHEDULE (continued)

- 16. Bacterial Transformation:** Competent *E. coli* cells: Theory, Process of transformation, Preparation of JM109 competent cells, Techniques of Biotechnology **(Feb. 28) Exp. 12**
- Quiz 2: DNA Purification, and Quantification (Mar. 1)**
- 17. Transformation Results:** Techniques for counting bacteria, Determining Percentage of Competent Cells, Transformation Efficiency, Calculations **(Mar. 1) Exp. 13**
March 5 to March 9 Spring Break
- 18. Plasmid Mini-Preps:** Removal of Impurities from the first DNA Precipitation, Lysozyme Digestion to remove Peptidoglycan Fragments **(Mar. 13) Exp. 13 (cont.)**
- 19. Purification of *pAmylase* Plasmid:** Endonuclease Restriction Digests, Analysis of DNA Fragments using AGE, Plasmid Clean-Up: Special Methods **(Mar. 15) Exp. 14**
- 20. Restriction Digest on *pAmylase* Plasmid:** Endonucleases: Activity and Specificity, Consideration of Fragment and Restriction Sites, Restriction Mapping **(Mar. 20) Exp. 15**
March 26: Last Day to Withdraw from Class (with a 'w')
- Midterm 2: Plasmid Isolation and Endonuclease Mapping (Mar. 27)**
- 21. Restriction Digestion Analysis:** Analysis of Agarose Gels for DNA Restriction Fragment Molecular Weights, Restriction Fragment Length Polymorphism (RFLP) **(Mar. 27) Exp. 15**
- 22. Polymerase Chain Reaction (PCR):** Polymerase Chain Reaction (PCR): Theory and Practice, Rapid DNA collection, Isolation and Purification using InstaGene Matrix **(Mar. 29) Exp. 16**
- 23. PCR:** PCR Fingerprint Analysis, Primer Discrimination and Fine Structure, DNA limits and Errors due to *Taq* Polymerase **(Apr. 3) Exp. 16 (cont.)**
- 24. Electrophoresis for PCR Products:** Amplified Fragment Length Polymorphism (AFLP), Degree of Certainty **(Apr. 5) Exp. 16 (analysis)**
- 25. Enzyme Activity:** Protein Isolation and Analysis, Protein Stability and Buffers, Colloidal Effects, Study of the activity of α -(alpha)-amylase **(Apr. 10) Exp. 17**
- 26. Protein Quantification and Isolation:** Methods to detect Proteins (Biuret, Bradford, Coomassie Blue, Silver Staining) **(Apr. 12) Exp. 18**
- Quiz 3: Polymerase Chain Reaction (PCR) (Apr. 17)**
- 27. Assaying Enzymatic Activity:** Enzyme Activity Assays, Different Techniques and Substrates, Zymograms (native PAGE) **(Apr. 17) Exp. 19**
- 28. Field trip;** Details to be announced **(Apr. 19)**
- 29. Protein Analysis using Gel Electrophoresis (Demonstration):** SDS-Polyacrylamide Gel Electrophoresis (PAGE), Mobility considerations, Lab Catch Up (if required) **(Apr. 24)**
- 30. Review for Final Exam:** Complete review of Labs (Eighteen) **(Apr. 26)**
- 31. FINAL EXAM: (May 1)**
- 32. PBSC Dept. of Biotechnology, Student Posters:**
 SC127 from 1:00 to 3:00 p.m. **(May 4)**
Attendance is Mandatory