Biotechnology Program SLOs

1. Employ the correct mathematical rules of operation, and be able to apply these to the preparation of reagents, buffers, pH adjustments, etc. (skills assessment; quizzes, assignments, exams)

2. Demonstrate the use of instrumentation and techniques common to the biotechnology laboratory. (skills assessment; practical exams)

3. Demonstrate the ability to keep a legal scientific notebook compatible with Biotechnology Industry standards. (rubric)

4. Practice proper laboratory safety. (performance assessment; soft skills rubric)

5. Demonstrate an understanding of key theoretical concepts in molecular biology and biotechnology as they relate to the biotechnology industry. (skills assessment; quizzes, assignments, exams)
Math Pre-Quiz

\[ \frac{1.5}{200} = \frac{x}{300} \quad x = \frac{1.5 \times 300}{200} = \frac{450}{200} = \frac{9}{4} = 2.25 \]

\[ 10^{-3} = 0.001 \]

\[ \log_{10} 100 = \log_{10} 10^2 = 2 \]

15% of 1000 = 0.15 \times 1000 = 150

\[ y = mx + b \]
\[ y = 4, m = 0.5, b = 2 \]
\[ x = \frac{y - b}{m} = \frac{4 - 2}{0.5} = \frac{2}{0.5} = 4 \]

\[ 200 \text{mL} \times \frac{1 \text{L}}{1000 \text{mL}} \times \frac{2 \text{mol}}{1 \text{L}} \times \frac{58 \text{g}}{1 \text{mol}} = 22.6 \text{g} \]

Out of 16 students:
1 student got zero correct out of 6 (0% score)
1 got 2 out of 6 (33% score)
4 got 3 out of 6 (50% score)
6 got 4 out of 6 (67% score)
1 got 5 out of 6 (83% score)
3 got 6 out of 6 (100% score)

(these were given anonymously; in future semesters I will record names though the score will not count against the student’s grade.)
Biot105 LAB Notebook Rubric, sample

- Bound Notebook
- Name on front or inside cover
- Table of Contents
- Numbered pages
- Signature at bottom of every page
- Instructor signature after each lab
- Sign across edge of attachments
- Void blank areas
- Single line through corrections
- Dated entries
- Clear and legible entries
- Continuation notes as necessary

- Safety Map of lab
- Lab Safety table from Seidman&Moore text

For each of the following, a title, intro/objectives, procedures, data/results, conclusions:

1. Scientific Method (dough)
2. Glassware, Measuring Volume
4. Importance of Sterile Technique
5. Micropipetting
6. Solution Making
7. Conductivity Measurements
8. Dilutions
9. Spectrophotometry
10. pH of Everyday Liquids
11. SOP, pH Meters
12. Buffers
13. Dialysis
14. Microscopy – wet lab
15. Microscopy – stages of mitosis
16. DNA Extraction
17. Corn Genetics
18. Catalase Assay
19. Aseptic Technique, Bacterial cultures
20. Gram/Simple Staining
21. Gel Electrophoresis
**Biotech 105 Performance Rubric (4/2012):**

A. **Professionalism** (in dress (wearing appropriate PPE), speech, attitude toward others; in response to feedback; being engaged in class and lab; working safely in laboratory)

B. **Attendance** (punctuality, staying entire class period, advanced notification if a class must be missed, minimal absenteeism)

C. **Responsibility** (comes to lab prepared (notebook, lab coat, gloves, calculator); has read through lab procedure and has protocol printed out and attached in notebook; turns assignments in on time)

D. **Teamwork** (ability to work with others; good flexibility, listening skills; assists with lab cleanup; takes responsibility for common areas)

E. **Efficiency** (ability to complete lab work in a reasonable amount of time)

F. **Accuracy** (good results in lab, good attention to detail)

G. **Oral communication** (English skills; clarity of thought and speech)

H. **Written communication** (clarity, grammar, neatness, readability)

I. **Critical thinking** (applies knowledge and logic to novel problems, recognizes when data look wrong)

J. **Understanding of theory** (biology, chemistry, molecular biology, etc.)

K. **Math skills** (ability to do calculations for solutions, dilutions)

L. **Self-motivation and independence** (how much supervision required)
PIO – Classroom set of conductivity meters

Minigrant application April 2011:

This request is for a classroom set of 16 conductivity meters. Our biotechnology industry advisory board members have informed us that conductivity measurement is an important skill that our graduates should have. To better prepare our students for the workplace, therefore, we would like to give them hands-on experience in making conductivity measurements, and help them understand the quality control applications of these measurements. We currently do not have conductivity meters for our students to use. Having these instruments will improve student learning, by updating our curriculum to meet current industry standards, and will support the local industry by providing well prepared job candidates.

Update, April 2012:

The classroom set of conductivity meters was received, and this spring the Biot105 classes (totaling about 26 students) were trained to use them. Students created a set of NaCl conductivity standards by doing serial dilutions, used Excel to create a graph showing the linear relationship between conductivity and NaCl concentration. They then used this standard curve to calculate the concentrations of solutions with unknown salt concentrations, based on their measured conductivities. In one section (LI-T), 11 out of 11 students tested were able to describe the relationship between conductivity and concentration.
Your friend Michael tells you that *Arabidopsis* plants grown with 24-hour/day light will produce fewer seeds than plants that are exposed to 16 hours of light during the day and 8 hours of dark at night. You want to conduct an experiment to test his claim.

**Explain how you will conduct your experiment.** Point out your hypothesis, what the independent (manipulated) and dependent (responding) variables would be, where you would carry out your experiment, what factors you would be controlling, how many replicates you’d use, etc.

15/16 students correctly stated a hypothesis (94%)

9/16 students correctly labeled independent and dependent variables (56%)

16/16 students designed well-controlled experiments with sufficient replicates (100%)
BIOT115A “Soft Skills” Rubric – (20 points)

The following list of skills that are not generally tested for in Biotechnology courses. This list was provided to the Ohlone Biotechnology Department by Genencor in response to questions about the skills (beyond knowledge of techniques, solution making, pipetting, etc.) that Genencor looks for when hiring laboratory technicians.

During this course students will be evaluated, according to observations made by the Instructor, on each of these skills. 20 points are available and points will be taken off according to observations made during each laboratory. At the end of the course students will receive a 1, 2, or 3 for each category (1 = Above the level expected for the course; 2 = Expected level of competence; 3 = Needs improvement) and feedback that includes what was observed and other information that the instructor feels may help the student become more skilled in these areas.

1. **Self-motivation and independence** (minimal amount of supervision required; ability to read, understand, and perform provided protocols independently)

2. **Efficiency** (ability to complete lab work in a reasonable amount of time)

3. **Professionalism** (in dress, speech, attitude towards others; in response to feedback)

4. **Teamwork** (ability to work with others; includes flexibility, listening skills, and the ability to collaborate and compromise)

5. **Accuracy** (good results in lab; attention to detail)

6. **Oral communication** (English skills; clarity of thought and speech)

7. **Written communication** (clarity and grammar)

8. **Critical thinking** (apply knowledge and logic to novel problems)

9. **Attendance** (punctuality, advanced notification if class will be missed, minimal absenteeism)

10. **Math skills** (ability to perform calculations for solutions, dilutions, and other basic laboratory mathematics)