BIMM 101: Recombinant DNA Laboratory
Fall 2019

Instructor Cindy Gustafson-Brown
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Phone 534-4242
email cgb@ucsd.edu (Put **BIMM101** in the subject line!)
Office hrs Fridays at the end of lab (in lab, or in York 2300)

Lecture Tues/Thurs 3:30-4:50, SEQUO 147

Labs Wed/Fri, 10A-1:50P
York 2310 and 2332 – Check which room you are in!

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Learning objectives

- Apply knowledge of molecular biology concepts and molecular techniques to plan experiments, explain and troubleshoot results
- Demonstrate proficiency at the basic molecular biology techniques used in the lab
- Explain the importance of proper controls in designing experiments and interpreting results
- Perform basic lab math skills, statistical analysis, and graphing
- Draw conclusions based on evidence and reasoning
- Use basic bioinformatics databases and applications
- Find, read, and evaluate primary literature

Required reading

- BIMM 101 Lab Manual, available at UCSD bookstore
- Additional required readings/videos will be posted on class web site on Canvas.

Required materials

- iClicker – registered on Canvas
- A lab notebook with carbon copies
- A lab coat – must extend down to your knees
- A fine point Sharpie marker – dark color
- UV-blocking eye protection (you may wear either safety glasses or goggles, but standard prescription eye glasses are not sufficient)
- Calculator
- Long pants and close-toed shoes are required in lab at all times

Computers

We will often use computers for data analysis and other exercises. We have access to a few computers in the lab, however if you have your own laptop computer it is recommended you bring it to lab.

Course design

We strive to create a collaborative environment in this course, in which students work together in a constructive way. To this end, the course is not graded on a curve. You are not in competition with your classmates, and you may ALL succeed! We encourage all to actively participate and communicate, with other students, with IAs and with the instructor. We assume you are here to learn. Just like athletic training for your body, learning requires **effort**. Readings in the lab manual lay the foundation for our lectures. Prior reading of the lab manual **before** lecture **is expected** in this class. There will be additional, pre-class materials (relevant background information) assigned to enhance your understanding. There will be clicker questions and group discussion in lecture, as well as group activities in lab. Confused? Ask questions! If you understand, help your classmates! Students are expected be active learners! Take charge of your own success!

Students with disabilities

http://disabilities.ucsd.edu | osd@ucsd.edu | 858-534-4382
Any student with a disability is welcome to contact us early in the quarter to work out reasonable accommodations to support their success in this course. Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD). Students are required to present their AFA letters to faculty and to the OSD Liaison in the Division of Biological Sciences well in advance so that accommodations may be arranged.

Lab Safety Training

Enrolled students MUST successfully complete the Biology Lab Safety Training and Assessment before the first lab session:
https://biology.ucsd.edu/education/undergrad/course/ug-labs.html
Please note that courses offered by other departments (Chemistry, for example) may have additional safety training requirements.

Enrollment and Absences

1. Students MUST attend the first lab session.
2. **ADD/DROP DEADLINES** are different for lab courses than lecture courses. Students who drop a Biology lab class after the end of the second class meeting will be assigned a "W".

3. Your attendance is required at EVERY lab, until all the experimental work for the day is completed. *This includes supplemental discussion/learning times in lab.*
4. Absences are not to be taken lightly. Your absence will place an unnecessary burden on your partner. There are no make-up labs and you will not be allowed in the lab on non-lab days or in the other lab sections, although you may be asked to make up the work from the day you missed.
5. Absences due to scheduling conflicts (*e.g.* other classes, exams, scheduled meetings, etc) will not be excused. If you are likely to have interviews for graduate school, please schedule them on non-lab days.
6. If you are ill or have an emergency on a day or when there is a lab, exam or assignment due, e-mail or call (instructor and IA) before the start of lab, the due date, or exam. It is not sufficient to contact your IA alone as your IA does not have the authority to excuse your absence. All absences without **PRIOR** approval of the instructor (not the IA) will be considered unauthorized, unless an emergency prevents you from notifying us. If an emergency prevents you from contacting us prior to the lab, you must contact Dr. Gus within 24 hours to explain.
7. If you are ill enough to miss lab, a due date, or an exam, you must go to a health clinic and provide documentation of your illness. Appropriate documentation will be required for all unavoidable absences. Provide this to your IA within 1 week of your absence.
8. **50-point penalty** for the first unauthorized, unexplained absence from the lab. If you miss 2 labs, you will need to drop the course or receive an F.
9. **Tardiness** in lab will impact your grade. You will miss important announcements and instructions. This puts an undue burden on your partner. If you are late more than once, you may be asked to drop the course.

Grading Scheme

	Points
14 pre-lab quizzes (3 pt each, lowest dropped)	39 points
15 lab notebook submissions (lowest dropped)	28 points
5 lab quizzes (60 pt each)	300 points
homework	300 points
iClicker responses	60 points
Lab performance/skills/professionalism	63 points
Comprehensive exam	210 points
Total	**1000 points**

1. **Pre-lab quizzes 4%:** Prior to most labs, there will be reading assignment and an online quiz. These quizzes are cumulatively worth a total of 4% of the final grade. They will be posted at least 36 hours prior to the start of lab, and will consist of 3 questions related to that day's lab. You will have two attempts to get the answers correct. Each quiz is due by 9AM on the day of the lab.

2. **Lab notebooks 3%:** At the end of each lab day, tear out the carbon copies of the entries for that day, staple them, and place them on the IA's desk.

3. **Lab quizzes 30%:** Lab quizzes are indicated on the schedule at the end of the syllabus. Each lab quiz is worth 6% of your final grade. The quizzes will cover the prior lectures, readings, and lab experiments in depth, and the purpose of that day's lab. Quizzes will be cumulative, to the extent that some experiments continue for some time and build on earlier material. Study guides will be posted on CANVAS.

   Note: <u>If you come into lab late and miss the quiz, you will receive a zero for that quiz.</u>

4. **Homework 30%:** Guidelines for each submission will be posted on CANVAS.

Assignment	Topic	Due date	points
Homework 1	Writing in your own voice	Fri, Oct 4	30
Homework 2	Agarose gel electrophoresis	Tues, Oct 15	45
Homework 3	PCR conditions	Tues, Oct 29	50
Homework 4	Ligation conditions	Thurs, Nov 7	50
Homework 5	Site-directed mutagenesis	Thurs, Nov 21	67
Homework 6	RNAi and PTC	Mon, Dec 9	58

5. **iClicker 6%:** More information on clicker questions is provided below.

6. **Lab performance/skills/professionalism 6%:** All students are expected to be good lab citizens. Your attitude, cooperation with others, conscientiousness, work ethic, technique and skill in the lab will contribute to your grade. Lab performance will be based on the following criteria:
   a. PRE-LAB PREPARATION
   b. PRE-LAB PREPARATION
   c. PRE-LAB PREPARATION
   d. Paying attention during instructions
   e. Being responsive to correction
   f. Technical skill and careful management of lab procedures (*e.g.* success of experimental procedures, judicious use of reagents, proper waste disposal, etc.)
   g. Taking care of university property (consistently locking your locker, etc.)
   h. Ability to adapt to unforeseen procedural changes
   i. Caliber of thinking before asking questions
   j. Scientific approach (*e.g.* controls, experimental design, powers of observation)

k. Accuracy
l. Independence and initiative
m. Safety consciousness
n. Organization and general neatness in lab
o. Contribution to your group and cooperation with classmates
p. Integrity

7. **Comprehensive exam 21%:** There will be a comprehensive exam on the last day of class, Friday, Dec 6, during the lab. There will be a review session the night before the exam.

Assignment Deadlines and Submission Policies

1. Assignments must be handed in **at the START** of lecture/lab on the due date. Assignments turned in more than 10 minutes after the start of class will be considered late. Penalty for late assignments is 40%, if turned in by 6 PM the next day. Late work is not accepted after that. It is <u>your</u> responsibility to make arrangements with your IA, **well in advance**, to turn in the late work.

2. In addition to the hard copy, you are required to submit an electronic copy of homework to Turnitin.com, by the due date/time. A link to the e-submission website will be provided on CANVAS. There is a penalty for late online submissions. Failure to submit to Turnitin.com will result in zero points.

   By taking this course, students agree that their assignments will be subject to review for textual similarity by Turnitin for the detection of plagiarism. All submitted assignments will be included as source documents in the Turnitin reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin service is subject to the terms of use agreement posted on the Turnitin site.

3. Although you will be doing the experiments and collecting data with a partner, you must hand in your own homework, *written in your own words.* **Copying someone else's lab report or homework is cheating. Showing your homework to someone else is likewise cheating.** (see below)**.**

Regrade Requests

All regrade requests should be submitted <u>in writing</u> within four days of receiving the graded material. You must read the regrade policy, posted on CANVAS, and submit your request with a "regrade request form" stapled to the test or assignment. If there is free time in the lab, it is recommended that you (respectfully) speak with your IA about material you did not understand. Alternatively you may make an appointment with your IA, or come to Dr. Gus' office hours.

Grade Distribution

A = 89% - 100%
B = 78% - 88.9%
C = 67% - 77.9%
D = 58% - 66.9%
F = below 58%

There will be pluses and minuses assigned.

iClickers

Your iClicker MUST be registered on Canvas in order for your responses to be assigned to you. (In the grey menu on the left, click on "tools.")

Points available:

40 points for participation
20 points for accurate answers
60 points total = 6% of your grade.

Lecture Participation Points (40 points)

In order to receive these points each day, you must respond to 80% of the questions in that lecture. It does NOT matter if your answer is correct. Everyone gets 2 free absences.

There are different numbers of questions each day, so you may use the table below to determine how many times you must respond for participation credit a given day.

total questions	6	5	4	3	2	1
required responses	5	4	4	3	2	1

Answering questions correctly (20 additional "accuracy" points possible)

There are different numbers of questions during each lecture. Every question is graded individually, even if it is a repeated question (e.g. asked before and after group discussion). The total number of questions over the quarter is unpredictable, and will only be known when the quarter ends.

If you correctly answer 70% of the total questions in a quarter, you will receive the full 20 points possible for accuracy.

Here is a hypothetical example: IF there are 100 questions total in a quarter, you must answer 70 questions correctly to receive the maximum credit of 20 points. In that case, you will receive 20 pt/70 Q = 0.286 points per question up to a maximum of 20 points.

This is NOT all or nothing. You get credit for as many as you answer correctly, up to 20 points.

iClicker FAQ

Q. Where can I buy a clicker?

You can get one at the UCSD bookstore. i

Q. Can I share a clicker with another student?

NO! If you are found to be using another student's clicker, or if another student is using your clicker, you will receive a failing grade in the class, and will be referred to the Office of Academic Integrity for administrative discipline.

Q. Where and when should I register my clicker?

Register it on class web site on Canvas. The link is on the left side of the homepage.

Q. When do the scored clicker questions start?

On Thursday, April 4, in lecture.

Q. What are the maximum clicker points possible?

60 points = 6% of your grade.

Q. How many days will we have clicker questions in lecture?

probably ~16 days

Q. How many days will I have to be present to qualify for full participation points?

~14 … you get 2 free absences without penalty

Q. How many participation points is each day worth?

~2.86 points per day up to a maximum of 40 points

Q. How do I get the participation points each day?

You must answer 80% of the questions posed that day. The number of questions will vary from lecture to lecture.

Q. If my battery fails, or I forget my clicker, but I do attend the class, do I get participation for that day?

No. You are allowed two free absences – so you don't have to ask me about making up the missed days. We don't have to negotiate credit; you can still get all 40 participation points from the remaining days you click in.

Q. If I click in during fewer than 14 lectures, will I get any participation points?

Yes, you can still get 2.86 points each day if you answer 80% of the questions that day.

Q. Will you post the participation points and clicker accuracy points on Canvas?

No. It is your responsibility to keep track of your own progress accumulating points.

Q. What is my best strategy for getting all the points?

Do your reading in advance, show up for as many lectures as possible, stay awake, and PARTICIPATE!

Course Website

This course is on CANVAS and should automatically appear on your CANVAS account as soon as you register for the class. We will use CANVAS to post announcements, information on experiments, exams, schedules, readings and practice material, experimental data, assignment guidelines, etc. Please check the site regularly and update yourself on the information provided.

Policy on Integrity of Scholarship

Your assignments for this class must be independently written, *i.e.* **your own ideas in your own words**. While discussion of data among lab partners is encouraged, each student must independently complete all text, references, figures, graphs, and tables. The submission of homework or papers by lab partners that contain copied work is forbidden. *Both* students will be held accountable. The exception is when a figure or table contains the raw data that is supplied to all members of the group (*e.g.* absorption spectra or gel photos). In this case the creation and labeling of that figure must be done independently. If you have questions about the difference between discussing your work with others and unauthorized collaboration, please ask your instructor or IA for clarification.

Because assignments are to be your own work in your own words, **you may not view, copy or paraphrase, to any extent, current or past papers or homework written by other students.** This is plagiarism**,** a direct attempt by the student to present the ideas of others as their own, and is no different than cheating on an exam.

Copying material from another source without putting it between quotation marks is plagiarism, even if the source is cited as a reference. In science writing it is not customary to directly quote others. Rather, you should paraphrase (or summarize) the ideas of your source **in your own words** and then *cite the reference.*

Plagiarism in homework or papers is rigorously sought out and penalized.

Because all quizzes, exams, homework, and iClicker participation are required for satisfactory completion of this course, any student caught cheating on a quiz, exam, homework, or iClicker participation may be given a failing grade for the course and referred to the Office of Academic Integrity for administrative discipline.

Week	Date	Lab Exercises	Reading in lab manual	Assignments/quizzes
Week 0	**Fri, Sept 27**	Pipetting Dilutions Calibrating pipets	Lab 1 Additional info "working in the lab" sections E, F, G	
Week 1	**Wed, Oct 2**	Agarose gel electrophoresis on two DNA samples of unknown size and concentration (estimating using standard curve)	Experiment 1, 1A-1D	
	Fri, Oct 4	**Computer Lab** Image Studio Lite Analysis of Agarose Gel Graphing Set-up liquid cultures of RFP and control promoter	 Appendix A Appendix B, C Starting Experiment 2, 2A	**Lab quiz 1** **Homework 1 - Writing in your own voice due today at 11:59 PM**
Week 2	**Wed, Oct 9**	Extract plasmids Check plasmids with AGE & nanodrop	 2B	
	Fri, Oct 11	Design and set up RFP PCR experiment **Start computer lab - plasmid map, restriction enzymes, designing primers**	Sub-experiment 2-1, 2C Appendix D	
Week 3	**Tues, Oct 15**			**Homework 2 - AGE, due in lecture**
	Wed, Oct 16	Run gel of PCRs, repeat PCR if needed Clean up PCR Set up digest of plasmid and RFP PCR product **Finish Appendix D computer lab if needed**	Finish 2C 2D 2E	**Lab quiz 2**
	Fri, Oct 18	Separate stuffer from plasmid - heat inactivate PCR digest Run gel of digest Plan ligations	2F 2F Sub-experiment 2-2: part of 2G	
Week 4	**Wed, Oct 23**	Set-up ligations & transform bacteria with ligations **Computer Lab: Design mutagenesis primers**	2H 2K	
	Fri, Oct 25	Count colonies Plan how to analyze ligation data Pick red colony from plate and start liquid culture	2I start 2I 2I	**Lab quiz 3**
Week 5	**Tues, Oct 29**			**Homework 3 - PCR, due in lecture**
	Wed, Oct 30	Purify recombinant Promoter-RFP plasmid and run gel Set up mutagenesis PCR **Computer lab: analyze ligation data**	2J 2L plan previously developed	
	Fri, Nov 1	Gel of PCR mutagenesis, repeat PCR Kinase/ligase/dpn treatment Transform cells	2M 2N 2N	

Week	Date	Lab Exercises	Reading in lab manual	Assignments/quizzes
Week 6	Wed, Nov 6	Check repeated PCRs, KLD and transformation if needed (others do not have to come to lab)		
	Thurs, Nov 7			**Homework 4 - Ligations, due in lecture**
	Fri, Nov 8	Analyze transformations Set-up liquid cultures: three colonies from mutagenesis Computer lab: Bioinformatics Intro to GenBank	2O 2O Appendix F	**Lab quiz 4**
Week 7	Wed, Nov 13	Streak cultures to maintain Purify plasmids from 3 cultures a Check plasmids using AGE & send for sequencing	2P 2Q 2Q	
	Fri, Nov 15	**Computer lab: analyze sequencing results** Use streaked bacteria to measure RFP Plan how to analyze RFP data	2R 2S start 2T	
Week 8	Wed, Nov 20	PTC extraction & PCR **Computer Lab: Analyze RFP data**	Experiment 4, 4A 2T	**Lab quiz 5**
	Thurs, Nov 21			**Homework 5 - SDM, due in lecture**
	Fri, Nov 22	Digest PTC PCRs, check with agarose gel, PTC taste-test (phenotyping) Pool genotype/phenotype data Observe *C.elegans* and induce RNAi	4B Experiment 3, 3A	
Week 9	Wed, Nov 27	Observe worm phenotypes Extract RNA and set up RT-qPCR **Computer Lab: Analyze PTC data**	3B 3C 4B	
	Fri, Nov 29	Thanksgiving Holiday		
Week 10	Wed, Dec 4	**Computer Lab:** Analyze qPCR data	Brief instructions at end of Exp. 3.	
	Fri, Dec 6	**Comprehensive exam**		
Finals week	Mon, Dec 9			**HW 6 - RNAi & PTC**