Biochemistry Laboratory - CHEM 351
Spring 2015

Instructor: Dr. Zhihua Du
Office: Neckers 324. Lab: Neckers 310. Email: zdu@chem.siu.edu
Office hours: Monday 3:00-4:00 PM and Wednesday 10:00-11:00 AM or by appointment

Teaching Assistants: Jinsai Shang  Sections 1 and 2  Office: Neckers 310  Email: jinsai@siu.edu
Jiang Zhu  Sections 3 and 4  Office: Neckers 310  Email: zjdsun@siu.edu

Lecture: Neckers 240  Time: 3:00 - 3:50 PM Friday (All sections)

Laboratory: Neckers 104  Time:  Section 1  8:00 - 11:50 AM Tuesday
Section 2  1:00 - 4:50 PM Tuesday
Section 3  8:00 - 11:50 AM Thursday
Section 4  1:00 - 4:50 PM Thursday

Required Text Book:

Required Access to D2L: Special announcements, important materials and notes will be posted for the class, including syllabus, schedules, protocols, guidelines, grades, lecture notes, schedule changes, quiz keys, safety information, and lab tutorials, etc.

Prerequisites: C or better in CHEM 200, 201, 210, 211, 339/340 and 341. Check the requirements for your major to make sure you have to take this class. Students taking CHEM 350 do NOT have to take CHEM 351 unless required by their degree.
Co-requisite: CHEM 350-Introduction to Biological Chemistry or CHEM 451b-Biochemistry. If you drop CHEM 350 or CHEM 451b you will have to drop CHEM 351 regardless of your grade in CHEM 351.

Deadlines relating to course registration:
http://registrar.siu.edu/calendars/registration15sp.html

I. COURSE DESCRIPTION
Biochemistry Laboratory is a one-semester (2 credits) course intended for Chemistry and Life Science students who have successfully completed one year of general chemistry and one semester of organic chemistry with their companion laboratories and that have retained the knowledge of the concepts taught in these classes. This is a 300-level course and as such will require significant time devoted to preparation before each lab and laborious in-depth analysis after each lab. If you do not remember any material covered in CHEM 200, 201, 210, 211 and 339/340 it is strongly recommended that you review it, because it will be necessary for success in this course. The objective of this course is to cover many commonly used biochemical techniques including: DNA cloning (PCR, plasmid preparation and digestion by restriction enzymes, insertion of DNAs into ligation independent cloning vectors, DNA transformation into bacterial cells), genetic engineering (construction of artificial genes), site directed mutagenesis to introduce various mutations, protein expression in bacterial cells, protein purification and concentration, protein crystallization, in vitro transcription (biosynthesis of RNA), RNA purification, in vitro enzymatic assays, various electrophoretic techniques (PAGE and agarose gels for the characterization and isolation of proteins, DNAs, and RNAs), chromatography (affinity, ion exchange, gel filtration, etc), spectroscopy (UV/Vis and MS), and use of computer databases. After successfully completing this course, students should acquire a good understanding on the basic concepts and practices of contemporary experimental biochemistry, as well as practical experience in various important biochemical techniques.

II. COURSE REQUIREMENTS
• Laboratory and lecture attendance is mandatory.
• Careful reading of every item in the syllabus and full compliance.
• Participation and completion of all laboratory assignments, experiments, exercises, and acceptable written laboratory reports and poster presentation.
• Completion of assigned readings from the required texts.
• Reading of all materials assigned in class, handouts and materials posted in D2L.
• Completion of assigned problems from the textbook and from class notes (problems will not be graded but will be used as material for quizzes).
• Complete and thorough reading of each laboratory protocol and handouts BEFORE each lab session.
• Following safety, cleanliness and behavior regulations.
• Keeping a tidy and up-to-the-minute laboratory notebook.
• Quizzes and cumulative Final Exam and covering ALL materials: experiments, handouts, assigned readings, problems, lecture notes and lab reports.
• There are NO Quiz and NO Final Exam make-ups.
• There are NO Lab make-ups. Only under extreme and EXTRAORDINARY circumstances, and with official written documentation (only hospital's release papers, documentation from jury duty, pre-proof of attendance to scientific meeting or job interview). Thursday sessions are not make-up sessions for Tuesday sessions and vice versa.
• Work with one or two partners for all Experiments. Lab partners will be assigned before the first Lab (based on student ID #) and these assignments will be permanent for the remainder of the semester. Please note your partner on both the pre-lab and your lab reports. But keep your own laboratory notebook, write original and unique Pre-Labs, Records and Lab reports with no resemblance to those of others (including your lab partners). Grades will be split among lab partners for material that is similar (half each or zero points), so please personalize your work.

III. GRADE
The final grade will be based on the following (including strict adherence to all regulations in section IV):

A. Projects. The lab experiments are grouped into five projects, projects 3 & 4 are graded together.

Project 1 = ............................................................................................................160 maximum points

- Pre-Lab = 40 points
- Notebook, Record and Data = 30 points
- Synopsis Style Lab Report = 90 points

Project 2 = .............................................................................................................70 maximum points

- Pre-Lab = 15 points
- Notebook, Record and Data = 15 points
- Synopsis Style Lab Report = 40 points

Projects 3 & 4 = ....................................................................................................170 maximum points

- Pre-Lab = 40 points
- Notebook, Record and Data = 40 points
- Synopsis Style Lab Report = 90 points

Project 5 = .............................................................................................................100 maximum points

- Pre-Lab = 20 points
- Notebook, Record and Data = 20 points
- Synopsis Style Lab Report = 60 points

B. Bioinformatics Exercises = ............................................................40 maximum points
C. One poster presentation = .............................................................60 maximum points
D. TA Evaluations = .........................................................................................40 maximum points
E. 10 quizzes (20 points each, two lowest grades will be dropped) = .................160 maximum points
F. Final Exam = ...........................................................200 maximum points

Total = .................................................................1000 maximum points

A = 1000 - 850 points (100.0% - 85.0%);
B = 849 - 700 points (84.9% - 70.0%);
C = 699 - 600 points (69.9% - 60.0%);
D = 599 - 500 points (59.9% - 50.0%);
Fail! less than 499 points (! 49.9%)

NOTE: The grade scale HAS ALREADY BEEN CURVED. NO adjustments will be made to the existing curve. Any deviation from the grading scale is NOT negotiable. This grading policy will be strictly enforced. You have to accumulate the exact number of points to receive a particular grade. For example, 850 points (85.0%) are equivalent to an A, and 849 points (84.9%) are equivalent to a B and so forth.

A. PROJECTS (500 points):
There will be five different projects for the laboratory:

- **Project-1:** Molecular cloning, expression, purification and crystallization of a catalytic fragment of human Dicer protein (160 points)
- **Project-2:** Biosynthesis of a double-stranded RNA by in vitro transcription using T7 RNA polymerase (70 points)
- **Project-3:** Site-directed mutagenesis of a catalytic fragment of human Dicer protein
- **Project-4:** Dicer-mediated in vitro RNA cleavage assays (170 points for Projects 3&4)
- **Project-5:** Protein engineering: molecular cloning, expression, and purification of JEV core protein (100 points)

Except project-5, all the other projects are actually different parts of a bigger project. Projects 3&4 will be graded together (only one lab report is needed that covers the topics of the two projects). All of these projects are based on published or on-going research projects from the instructor's lab. The projects shall work. However, due to the stochastic nature of biochemical experiments, your particular experiments may not give you the expected results. In that case, the instructor or TAs will provide sample data that have been obtained by the protocols to you. When using the sample data, you need to discuss what you did wrong and what could be improved. Biochemistry experiments do not usually work in a set 3-4 hour period. All projects need more than two laboratory sessions to finish. Meanwhile, there are usually a lot of waiting times during a typical biochemistry experiment. To maximize the use of precious lab time (and hence your learning opportunities), you will be working on two (or even three) different projects during most of the lab sessions. The experiments have been carefully planned. You should be able to complete the experiments in the allotted time if you are prepared for the lab.

**Pre-Labs:**

Pre-labs include the following information: date, name of the experiment, objective and rationale for experiment (several sentences), anticipated results, equipment and reagents used in the experiment and an outline of the steps followed (flowchart). In addition to this standard preparation for lab, you should also answer any questions posted in the online manual and transfer information into your lab notebook as needed. Pre-Lab are based on the required reading and experimental procedures as posted in D2L for each lab session. **If the lab session has multiple projects, you will need to have a Pre-Lab for each of the projects.** Hard copies of Pre-Labs (written in your notebook. No emails) are due at the beginning of each lab, and will be graded at the beginning by the TA. **Students who do not have a Pre-Lab ready before the lab session will not be allowed to conduct the experiment and will receive zero points for that lab session.** Be aware that there are NO lab make-ups. Students without Pre-Labs are a liability to their fellow students since they are not prepared for safety precautions to be taken before an experiment, and will be asked to leave the laboratory session for everyone’s safety. **You will NOT be allowed to leave the lab and return back later with a Pre-Lab, so arrive prepared.** The Pre-Lab grade for a project will be calculated from all the Pre-Labs, for example, project-1 needs seven lab sessions to finish, the 40 pre-lab points for project-1 will be based on the total grade of the seven Pre-Labs and the Pre-Lab of the week-2 experiments.

**Notebook, Records and Data:**

Observation is a key facet of the scientific method, and without a written record of observations and procedures, any laboratory experiment is an exercise in futility. You will be expected to keep a **detailed record** of the procedure followed for each experiment with up to the minute observations. The notebook should be intelligible enough so that a trained biochemist could repeat the work or complete an unfinished experiment. The laboratory notebook must be a permanently bound record book, and all records must be written in permanent ink. The original data must not be altered or erased. If you make an error in data observations or calculations, correct it by drawing a single line through. Because multiple projects will be carried out simultaneously in most lab sessions, you need to divide the notebook into seven different parts (for week-2 experiments, the five different projects and bioinformatics exercise), number the pages, and save the first several pages for a table of contents. View the notebook as your journal of what actually takes place in the lab. A lab notebook should contain the followings:

- A Table of Contents to aid navigation of the notebook
- A date on each page and your signature after each session
- An introduction / explanation to yourself of the purpose of the experiment
- Procedural notes
- Values collected (i.e., weight out 0.150 grams of IPTG to induce 1 L of LB culture)
- All results collected, along with observations (the cobalt resin turn magenta when elution with a buffer containing 200 mM immidazole, and the protocol didn’t mention that? That's an observation!)
- Analysis of the data – legible tables, graphs, and calculations
- Brief conclusions
Your teaching assistant will inspect your laboratory notebook during each experiment, and a grade will be given for proper notebook and record keeping at the end of every laboratory session. Similar to the Pre-Lab grade the Notebook, Records and Data grade for a project will be calculated from all the sessions, for example, project-1 needs seven lab sessions to finish, the 30 Notebook, Records and Data points for project-1 will be based on the total grade of the seven sessions and the week-2 session.

NOTE: You need to turn in your notebook with the final lab report. If you do not return back the notebook on the last day you will be deducted 105 points that correspond to ALL of the Laboratory Notebook, Record and Data points. If you want your notebook back, you can go to Neckers 310 after the Final Exam.

Synopsis Style Reports:
You are required to submit a total of four lab reports (see Schedule). You need to use a word processor such as Microsoft Word for typing your reports. Your lab reports should be written in the format of a scientific research paper consisting of the following sections:
1. A title page: this includes the title of your report, your name and partner’s names, and your address.
2. Abstract: a brief description (no more than 200 words) of the project, including introduction, methods, results, conclusions, and significance of the findings.
3. Introduction: this provides background information about the project, including the state of knowledge of the research at the time of its inception, the objective of the research, the specific questions to be addressed, and the approach taken. You may also include the major conclusion.
4. Materials and Methods: this section is a recount of the experiments conducted. It should describe the methods and the sources of the materials used in enough details so that a trained biochemist should be able to replicate your results. This section should be more concise than the corresponding section in the laboratory notebook.
5. Results: this section presents the experimental results, illustrated with figures and tables (use legends to explain the meanings of each figure and table).
6. Discussion and Conclusion: in this section, you explain how you interpret the outcomes of your experiments. First, how do you evaluate your data: good, mediocre, terrible, or un-interpretable? Why? After validating your data, you should discuss your results. Whether you achieve the expected results? What is the meaning of your results? How do the results help us understand the scientific problem? How do your results relate to the concepts and hypotheses outlined in the introduction? You may discuss the theory that supports your results or is against your conclusion. You may also suggest possible improvements and future studies.
7. References cited: this section is a compilation of all citations made within the lab report.

The reports are to be handed in as printouts, not emailed. It is your responsibility to keep track of when the lab reports are due. Late submissions will result in a 5 point-deduction for each day that the report is late (no more than 5 days late). Reports turned in after the laboratory session has started will be deducted points. After 5 days, including weekends, of the due date reports will no longer be accepted. Graded reports will be returned back 2 weeks from the due date on the day of your lab session (except for the lab report for Project-5, which will be available during Final’s week). Please read over them carefully and if you have any questions make an appointment with your TA. If your TA decides that more points should be deducted or added, your TA will take the report and give it to the instructor for discussion and approval, only then will your recorded grade be modified.

NOTE: The instructor will NOT make any adjustments to any grade unless your TA has been consulted first. If you have questions about your grade take care of it promptly by making an appointment within the first week. After 7 days NO ADJUSTMENTS WILL BE MADE TO ANY GRADE. ***Discussion of grades is by APPOINTMENT ONLY and only after you had at least 24 HOURS to go over your graded materials. *** (Students that disrupt the lab sessions with grade questions will be asked to leave).

NOTE: only one lab report is needed for Projects 3 & 4. You need to combine the contents of the two projects in a single lab report.

B. BIOINFORMATICS EXERCISE (40 points):
Follow the guidelines as described in the handout that will be posted in D2L. See the Schedule for the due date of the Bioinformatics Exercise.

C. POSTER (60 points):
You are required to prepare a poster (one page, using Microsoft Powerpoint or similar tools) that combines results from Projects1-4. See Chapter 1, section “Scientific Poster”, pages 12-14 of the text book for more instructions of making a poster. The poster needs to include the following sections:
- Title
- Contributors (including you and partners) and their institutional affiliations
- Abstract
Introduction, including background/literature review and research question(s).
Materials and methods
Results
Conclusions
Literature cited
Acknowledgements
Contact information

Due to the large enrollment of the course and the cost of making a real poster, it is not practical to have an actual poster presentation session for all students to display their posters. Therefore, you are only required to print-out your poster in a regular 8.5 by 11 inches (A4) size paper and handed it in to the TA during the last lab session (see Schedule). For those students who want to give a real poster presentation, an optional poster session will be conducted during the last week’s lecture period (May 8th, 3-3:50 PM) in the study area outside of Neckers 240. If you want to participate in the optional poster session, you need to inform your TA by email at least 24 hours in advance.

D. TA EVALUATIONS (40 points):
The TA evaluations are based on: 1) your attitude/effort; 2) overall performance/participation; 3) independence; 4) cleanliness (clean your bench area after you are done); 5) preparedness; 6) punctuality; 7) team work and interaction with lab partner, classmates, teaching assistants and instructor; 8) following instructions from your TA or instructor; 9) adherence to procedures and safety protocols; 10) attendance to laboratory sessions. You will be evaluated on a weekly basis. Your TA will keep track of your performance on a weekly basis and at the end of the semester your TA will determine a final TA grade (10-8.5/A = Outstanding; 8.4-7.5/B = Very good; 7.4-6.5/C = Good; 6.4-5.5/D = Fair; 5.4-0/F = Poor). Points will be given every time that the lab meets (maximum of 13 x 10 = 130). At the end of the semester, the accumulated points will be used to calculate the final TA grade (Example: 110 points out of 130 = 84.6% which is equivalent to 33.8 TA points). The final TA grade will be available during finals week. You can ask your TA for an update on how you are doing throughout the semester. NOTE: Independence will be given high priority, so make sure to familiarize yourself with the procedure and avoid asking your TA, classmates, lab partner and instructor for obvious details already available in the handouts that should have been evident to you from writing the Pre-Lab and studying for the quiz for that day. Try to work by yourself as much as possible and divide the work evenly among your lab partners.

E. QUIZZES (160 points):
There will be 10 quizzes given at the beginning of most laboratory sessions (see Schedule). NO MAKEUP quizzes will be given. However, two of the lowest grades of the quizzes will be dropped. All quizzes will be “closed-book”; no notes will be needed or permitted; no programmable calculators will be allowed. The materials for the quizzes will be derived from the assigned readings for each experiment, problems in the book, lecture notes, and lab procedures. The quizzes will have a mixed format (multiple-choice, fill in the blank, and short answer). Because the four lab sections meet at different times, each section will have a different set of quiz questions (with the same level of difficulty). Questions about any quiz grade should be directed to the instructor within a week after receiving a grade and after reviewing your quiz for at least 24 hours. After 7 days NO CHANGES WILL BE MADE TO THE GRADE.

F. FINAL EXAM (200 points):
The Final Exam is cumulative and comprehensive. The format of the Final Exam will be multiple-choice only. In compliance with the university policy regarding final exams, the exam will take place during finals week on the date published by the Registrar's Office (Note: the Registrar's Office could change the Final's schedule throughout the semester). The date will be according to the lecture time (3:00 on Friday) as specified at: http://registrar.siuc.edu/calendars/finalexam.html. The exam will be “closed-book”; no notes will be needed, or permitted; no programmable calculators will be allowed. The material for the final will be derived from the quizzes, the assigned readings for each experiment, problems in the book, lecture notes, lab experiments, lab procedures and lab reports. The instructor grades the final exams and any questions regarding the exam should be addressed directly to the instructor within three days after the exam grade becomes available (will be posted in D2L as soon as possible). After 3 days NO CHANGES WILL BE MADE TO THE GRADE.

IV. REGULATIONS ***READ CAREFULLY***
(Your TA and instructor will make sure that you comply with regulations before, during and after each lab session.)
Laboratory Safety:
Biochemical experiments often involve additional hazards beyond those normally associated with a Chemistry laboratory. **Follow carefully all instructions from your teaching assistant, instructor, assigned texts and handouts** to avoid harming yourself and others. When working in the laboratory, you will be **required to wear your personal protective equipment, which includes proper eye protection, gloves and closed toe shoes. NO SANDALS, NO SKIRTS of any length and NO SHORTS of any length** are permitted in the laboratory. **ANYONE WITHOUT the PROPER LAB ATTIRE WILL BE ASKED TO LEAVE THE LAB and ZERO POINTS WILL BE GIVEN FOR THE NOTEBOOK and RECORD GRADE, PRELAB GRADE AND QUIZ of the day.** Failure to comply with safety procedures will be subject to sanctions described in the Student Conduct Code (http://policies.siuc.edu/documents/StudentConductCodeFINALMay32011.pdf) and could result in a failing grade for the course. Familiarize yourself with:

1. Chapter 1, Section A. "Safety in the Laboratory", pages 2-5 of the text book;
2. Safety notes (if any) for each experiment provided in the protocol;
3. MSDS sheets for the reagents used for each experiment and posted MSDS sheets in D2L;
4. The location of eyewashes, safety showers and fire extinguishers.

If you have any health-related condition (i.e. allergies, chemical susceptibility, pregnancy, compromised immune system, etc.), please notify your teaching assistant and instructor at the beginning of the course and get clearance from your doctor before attending the first laboratory session.

**Hazardous Chemical and Biological Disposal:**
Biological and chemical waste must be disposed of properly in accordance with local, state and federal regulations. If you are unsure on how to dispose of anything, please ask your teaching assistant. All hazardous waste must be properly labeled and should not be mixed with non-hazardous trash. **All waste should be deposited in the labeled bottles, pans and containers placed in the hood. No backpacks, coats, or any material that is not associated with the experiment should be on the benchtop at all.** Failure to dispose properly of chemical and biological waste is a "Laboratory Safety" violation.

**Laboratory Cleanliness:** You are responsible for cleaning your bench space. Your teaching assistant will inspect your bench space after each experiment and TA points will be deducted for failure to clean your area. If you drop the course, it is your responsibility to arrange with the teaching assistant for check out from your drawer. Failure to check out will result in a monetary charge.

**Laboratory sessions will be conducted as follows:**
- Turn in laboratory report or bioinformatics exercise if applicable
- A 15-minute quiz (when applicable) and your TA will grade the Pre-Lab
- Your TA will take about 5 minutes to go through special precautions (if any) needed to be taken in the lab session.
- Experiment will begin at ~8:20 AM or 1:20 PM.
- 11:00 AM - 11:45 PM / 4:00 PM - 4:45 PM: Notebooks and Records will be graded (do not leave the lab without a grade, no grade will be given after you leave the lab).
- 11:50 PM / 4:50 PM: Locked drawers, clean benches, and everybody gone. The stockroom closes at 4:30 PM.

**Class Etiquette:**
Pagers and cellular phones must be turned off or in vibrate mode during lab session and the lecture. If you must leave the room to answer an emergency call, please do so quietly. Make sure to remove your gloves before leaving the lab and wash your hands. Also please, no newspaper reading or working on material from any other class (this includes CHEM 350). During any waiting period, you could start your data analysis, laboratory report or study for this class (CHEM 351). You should be engaged 100% during the lab and the lecture. Do not start packing before the lecture ends on Friday. The lecture finishes at 3:50 PM unless class is dismissed early.

**Incomplete Grades:**
The university policy regarding an incomplete grade states: "An INC is assigned when, for reasons beyond their control, students engaged in *passing work* (an F is NOT considered passing work) are unable to complete all class assignments." Under no circumstances, will an INC be given to a failing student to prevent him or her from receiving an F. If you do not attend the course and fail to drop from the class you will receive a **WF/F grade depending on the last day that you attended, you will not receive an INC.**

**Academic Dishonesty:**
Cheating is an Act of Academic Dishonesty and a serious violation of the standards in the Student Conduct Code (http://policies.siuc.edu/documents/StudentConductCodeFINALMay32011.pdf) and as such it will NOT be tolerated. Students caught cheating or helping any one cheat on a Quiz, Final Exam, Pre-Lab or Report will automatically receive zero points for the material in question. A memo will be written and submitted to the Chair of the Department to keep an official record of the incident. The student may have to meet with the Chair and he will make recommendations following the procedures described in http://srr.siu.edu/faculty_resources/academic_dishonesty.html, which could result in a failing grade for the whole course. Examples:

- Copying ANY PORTION of a Pre-Lab, Record or Report from other student/s (past and present).
- Making up results.
- Letting your lab partner do most of the work.
- Doing everything for your lab partner or not allowing your lab partner to engage in the learning process.
- Allowing others to copy your lab reports facilitates and encourages cheating, even if it is your lab partner.
- Having a similar lab report as your lab partner or classmates (present or past).
- Using the same plots, graphs and tables made by your lab partner, classmates and former students.

**Behavior:**

Disruptive behavior will NOT be tolerated during lab and during lecture. Following instructions and procedures is necessary for your learning and for others safety. Your teaching assistant or instructor may ask anyone to leave the laboratory for dangerous, disruptive behavior, non-participation in laboratory activities, failure in trying to follow the experimental procedure, failure to wear protective personal equipment, noticeable unpreparedness or any interference with the experiments of your classmates. If you are asked to leave the laboratory, you will not receive points for any part of the Experiment. If your failure to follow direct instructions from the instructor or teaching assistants endangers yourself, any other person or the environment, you will be asked to refrain from attending class until meeting with the Chair of the department. If your behavior and level of disruption interferes with the course instruction and affects your classmates you will be asked to leave the laboratory or the class lecture. Depending on the level of the disruption, either campus police or the office of Student Rights and Responsibilities will be contacted. Verbal or written communications directed to other student/s in the class, teaching assistants or the instructor that are considered inappropriate, insulting and hostile by the recipient/s will be considered an act of social misconduct. Depending on the level of the offense you could be asked to refrain from attending class until meeting with the Chair of the department to discuss possible sanctions. Acts of Social Misconduct and Sanctions are clearly explained in the SIUC Student Conduct Code (http://policies.siuc.edu/documents/StudentConductCodeFINALMay32011.pdf).

**SIU Emergency Procedures:**

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu. Department of Safety's website www.dps.siu.edu (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency. Instructors/teaching assistant will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor/teaching assistant during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor/teaching assistant in evacuating the building or sheltering within the facility.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Quiz</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan-20/22</td>
<td>Lab: no lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jan-23</td>
<td>Lecture: Introduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 27/29</td>
<td>Lab: Using pipettes and making solutions</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jan-30</td>
<td>Lecture: Biochemistry basics and polymerase chain reaction (PCR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Feb-3/5</td>
<td>Lab: Project1 (part1)-PCR</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb-6</td>
<td>Lecture: DNA electrophoresis and digestion, in vitro transcription</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Feb-10/12</td>
<td>Lab: Project1 (part2)-DNA purification and T4 DNA polymerase digestion</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project2 (part1)-in vitro transcription by T7 RNA polymerase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb-13</td>
<td>Lecture: Ligation independent cloning (LIC), RNA electrophoresis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Feb-17/19</td>
<td>Lab: Project1 (part3)-LIC cloning &amp; transformation into DH5α cells</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project2 (part2)-polyacrylamide gel electrophoresis for RNA analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>and purification</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb-20</td>
<td>Lecture: Protein expression in bacterial cells, site-directed mutagenesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Feb-24/26</td>
<td>Lab: Project1 (part4)-plasmid miniprep, transformation into codon-plus cells, and induction with IPTG</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project2 (part3)-RNA electroelution</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project3 (part1)-mutagenic PCR followed by DpnI digestion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feb-27</td>
<td>Lecture: Protein purification, affinity chromatography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Mar-3/5</td>
<td>Lab: Project1 (part5)-harvest, protein purification by affinity chromatography, dialysis, and HRV 3C protease digestion</td>
<td>6</td>
<td>Lab report: project2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project3 (part2)-transformation into DH5α cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mar-6</td>
<td>Lecture: reverse IMAC and ion exchange chromatography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Mar 9-13</td>
<td><strong>Spring Break</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mar-17/19</td>
<td>Lab: Project1 (part6)-target protein purification by reverse IMAC and ion exchange chromatography</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project3 (part3)-plasmid miniprep, transformation into codon-plus cells, and induction with IPTG</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mar-20</td>
<td>Lecture: SDS-PAGE and protein concentration/crystallization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mar-24/26</td>
<td>Lab: Project1 (part7)-SDS-PAGE, protein concentration and crystallization</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project3 (part4)-harvest, protein purification by affinity chromatography, dialysis, and HRV 3C protease digestion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mar-27</td>
<td>Lecture: Protein engineering, in vitro enzymatic assays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Mar31/Apr2</td>
<td>Lab: Project3 (part5)-reverse IMAC and SDS-PAGE</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project4 (part1)-in vitro dsRNA cleavage assays</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project5 (part1)-making artificial gene by one-pot PCR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr-3</td>
<td>Lecture: Structure and mechanism of Dicer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Apr-7/9</td>
<td>Lab: Project4 (part2)-RNA analysis by polyacrylamide gel electrophoresis</td>
<td>10</td>
<td>Lab report: project1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project5 (part2)-DNA purification and T4 DNA polymerase digestion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr-10</td>
<td>Lecture: Bioinformatics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Apr-14/16</td>
<td>Lab: Project5 (part3)-LIC cloning &amp; transformation into DH5α cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Bioinformatics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apr-17</td>
<td>Lecture: Bioinformatics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 14  | Apr-21/23 | Lab: Project5 (part4)-plasmid miniprep, transformation into codon-plus cells, and induction with IPTG

**Bioinformatics** | Lab report: projects 3&4 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr-24</td>
<td>Lecture: DNA sequencing and protein identification by MS</td>
</tr>
<tr>
<td>15</td>
<td>Apr-28/30</td>
<td>Lab: Project5 (part5)-protein purification by affinity chromatography and SDS-PAGE</td>
</tr>
<tr>
<td></td>
<td>May 1</td>
<td>Lecture: Review</td>
</tr>
<tr>
<td>16</td>
<td>May-5/7</td>
<td>Lab: TA evaluations, Class evaluations, Check-out</td>
</tr>
<tr>
<td></td>
<td>May-8</td>
<td>Poster presentation session (optional)</td>
</tr>
<tr>
<td>17</td>
<td>May 11-15</td>
<td><strong>Final Exam: Friday May 15, 2:45-4:45 PM, Neckers 240</strong></td>
</tr>
</tbody>
</table>
After careful reading of EVERY item in the Syllabus, please remove this page, fill out the requested items and return this page to your teaching assistant before the first introductory lab session on week 2 (Tues-January 27; or Thurs-January 29, which ever applies to you). If you do not submit this signed page, you will not be allowed to perform any laboratory work.

I, the undersigned, have read and have full understanding of every single item covered in this syllabus and pledge to follow the requirements and regulations while present in the laboratory. I understand that if I do not comply with these regulations, I will be asked to leave the laboratory by my instructor and will receive a grade of ZERO for that experiment. I understand that if I willfully destroy lab equipment, I will be expected to pay for the damage caused.

Print Full Name: ______________________________ Signature: ______________________________
DAWG TAG #: ______________________________
Date: ______________________________
Section: ______________________________
Major ______________________________ Expected date for graduation ______________________________

List the names for the chemistry courses and laboratories that you have taken and where you took them:

List other science courses that you have taken and where you took them:

If involved in research, please provide a brief explanation of the type of research you do: