### Table of Contents

#### Introductory Information

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule</td>
<td>ii</td>
</tr>
<tr>
<td>Evaluation and Assessment</td>
<td>iii</td>
</tr>
<tr>
<td>Course Policies</td>
<td>v</td>
</tr>
<tr>
<td>Formal Laboratory Report Format</td>
<td>vi</td>
</tr>
<tr>
<td>University Policy on Academic Integrity</td>
<td>vii</td>
</tr>
<tr>
<td>Safety Regulations</td>
<td>viii</td>
</tr>
<tr>
<td>Building and Earthquake Evacuation Procedures</td>
<td>x</td>
</tr>
<tr>
<td>Laboratory Acknowledgement Form</td>
<td>xi</td>
</tr>
</tbody>
</table>

#### Laboratory Procedures

<table>
<thead>
<tr>
<th>Lab 1 – Primer Design</th>
<th>1-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix 1A: Primer Design Characteristics</td>
<td>1-15</td>
</tr>
<tr>
<td>Appendix 1B: Using Net Primer</td>
<td>1-18</td>
</tr>
<tr>
<td>Appendix 1C: Using IDT SciTools Oligo Analyzer</td>
<td>1-20</td>
</tr>
<tr>
<td>Appendix 1D: Using Primer3</td>
<td>1-21</td>
</tr>
<tr>
<td>Lab 2 – Site Directed Mutagenesis of a Carbohydrate Binding Module</td>
<td>2-1</td>
</tr>
<tr>
<td>Appendix 2A: Cloning of the Wild Type CBMs</td>
<td>2-30</td>
</tr>
<tr>
<td>Lab 3 – Purification and Characterization of a Mutant CBM</td>
<td>3-1</td>
</tr>
<tr>
<td>Appendix 3A: Use of a Flow Adaptor</td>
<td>3-33</td>
</tr>
<tr>
<td>Appendix 3B: Plate Reader Instructions</td>
<td>3-34</td>
</tr>
<tr>
<td>Appendix 3C: Pouring and Running a Polyacrylamide Gel</td>
<td>3-36</td>
</tr>
<tr>
<td>Appendix 3D: Recipes for SDS-Polyacrylamide Gels</td>
<td>3-40</td>
</tr>
<tr>
<td>Appendix 3E: Recipes for Non-Denaturing Polyacrylamide Gels</td>
<td>3-41</td>
</tr>
<tr>
<td>Appendix 3F: Drying a Polyacrylamide Gel Using Cellophane</td>
<td>3-42</td>
</tr>
<tr>
<td>Week</td>
<td>Dates</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Jan. 6-10</td>
</tr>
<tr>
<td>2</td>
<td>Jan. 13-17</td>
</tr>
<tr>
<td>3</td>
<td>Jan. 20-24</td>
</tr>
<tr>
<td>4</td>
<td>Jan. 27-31</td>
</tr>
<tr>
<td>5</td>
<td>Feb. 3-7</td>
</tr>
<tr>
<td>6</td>
<td>Feb. 10-14</td>
</tr>
<tr>
<td>7</td>
<td>Feb. 17-21</td>
</tr>
<tr>
<td>8</td>
<td>Feb. 24-28</td>
</tr>
<tr>
<td>9</td>
<td>Mar. 3-7</td>
</tr>
<tr>
<td>10</td>
<td>Mar. 10-14</td>
</tr>
<tr>
<td>11</td>
<td>Mar. 17-21</td>
</tr>
<tr>
<td>12</td>
<td>Mar. 24-28</td>
</tr>
<tr>
<td>13</td>
<td>Mar. 31-Apr. 4</td>
</tr>
</tbody>
</table>
Evaluation and Assessment

Percentage Breakdown for the Course:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Reports</td>
<td>35 %</td>
<td>see below and page vi for more details</td>
</tr>
<tr>
<td>Exams</td>
<td>40 %</td>
<td>see below for more details</td>
</tr>
<tr>
<td>Practical Assessment</td>
<td>15 %</td>
<td>see page iv for more details</td>
</tr>
<tr>
<td>Laboratory Journal</td>
<td>10 %</td>
<td>see page iv for more details</td>
</tr>
</tbody>
</table>

Final Percentages will be assigned Letter Grades as follows:
(see CourseSpaces for a written description what each letter grade represents)

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.00 - 100</td>
<td>A+</td>
</tr>
<tr>
<td>85.00 - 89.99</td>
<td>A</td>
</tr>
<tr>
<td>80.00 - 84.99</td>
<td>A-</td>
</tr>
<tr>
<td>77.00 - 79.99</td>
<td>B+</td>
</tr>
<tr>
<td>73.00 - 76.99</td>
<td>B</td>
</tr>
<tr>
<td>70.00 - 72.99</td>
<td>B-</td>
</tr>
<tr>
<td>65.00 - 69.99</td>
<td>C+</td>
</tr>
<tr>
<td>60.00 - 64.99</td>
<td>C</td>
</tr>
<tr>
<td>50.00 - 59.99</td>
<td>D</td>
</tr>
<tr>
<td>0 - 49.99</td>
<td>F (or N)</td>
</tr>
</tbody>
</table>

Lab Reports (35%): Marks for the lab reports will be assigned as indicated below.

- Labs 1 and 3 will be informal lab report write ups.
- Lab 2 will require a formal lab report write up.

<table>
<thead>
<tr>
<th>Laboratory Report</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab 1 – Primer Design</td>
<td>15</td>
</tr>
<tr>
<td>Lab 2 – Site-Directed Mutagenesis of a CBM Protein</td>
<td>40</td>
</tr>
<tr>
<td>Lab 3 – Purification and Characterization of a Mutant CBM Protein</td>
<td>45</td>
</tr>
<tr>
<td>Total Marks</td>
<td>100</td>
</tr>
</tbody>
</table>

Lab Exams (40%):

The lab exams are non-cumulative. The midterm will be a three hour exam and will cover material from labs 1 and 2. The final exam will be a three hour exam scheduled during the regular exam period in April and will cover material from lab 3 only.

- Midterm (TBA) covers labs 1 and 2 (20%)
- Final Exam (TBA) covers lab 3 (20%)
Practical Evaluation (15%): 

Practical assessments will be done for each student by laboratory instructors and teaching assistants and will consist of:

- Frequent pre-lab quizzes to assess preparedness
- Pre-lab and in-lab calculation and problem sets
- Frequent evaluation of experimental results to assess technique
- Thoroughness of clean-up at each bench after the lab

Maintenance of a Laboratory Journal (10%):

You are expected to provide a hard cover or spiral bound notebook to be used as a laboratory journal. This book is dedicated to recording raw data to be used for writing lab reports and must be brought to every lab session. Data will be marked periodically throughout the course and will be submitted in April for final evaluation.

Please write in ink and include the following:

- Date and title of the experiment
- Unknown numbers
- Pre-lab or in-lab calculations
- All raw data you (or your partner) produce
- Experimental conditions (temperature, time, wavelengths, etc...)
- Gel loading order and volumes
- Changes to the procedure or mistakes/errors made
- **Observations and interpretations of results** (this is new compared to expectations in second and third year lab courses in this department)

**Note**: Portions of lab reports will not be considered as lab journal entries.
Course Policies

Attendance
Laboratory attendance is compulsory. Failure to attend a lab without a written medical excuse will result in the forfeit of all marks associated with the lab. A change of lab section must be arranged with the lab instructor prior to the lab period. Students who miss a lab for medical reasons are responsible for maintaining their lab journal and for obtaining the data in order to write up the lab report.
It is important to arrive on time. Students who arrive after a pre-lab quiz has begun will not be given extra time to complete the quiz. No makeup quizzes will be given for students who arrive after a quiz is over. The instructor reserves the right to refuse late arrivals or withhold practical marks associated with that lab.

Re-marking Policy
Students have one week to review marked assignments, lab reports, quizzes, journal entries, practical assessments, etc... and resubmit them. Any resubmissions will involve remarking of the entire assignment and students will be given the grade assigned after this second review.

Accessibility Statement
Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach an instructor and/or the Resource Centre for Students with a Disability (RCSD) as soon as possible. The RCSD staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations http://rcsd.uvic.ca/. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.
Formal Laboratory Report Format

• All laboratory reports must be written up individually.
• Text should be type written and double-spaced.
• Use 12 point font of a standard style such as Arial or Times New Roman.
• Refer to CourseSpaces for a more detailed description of lab report expectations.

Laboratory reports should be brief and concise and should include the following:

Introduction: In a few well written paragraphs, state the purpose and introduce the main concepts of the lab by defining important terms and explaining new ideas. As well, briefly describe and indicate the purpose of performing the individual techniques or experiments.

Methods: Refer to the source of the procedure by referencing the lab manual in proper citation format. Include any significant modifications that were communicated to you either verbally or in written form. Also, include mistakes that were made by you, your partner or other individuals that may have affected your results.

Results: Organize data in the form of fully labeled tables, graphs or figures. State the results in written form in a Results Summary placed before the figures, drawing attention to the key results. Reserve all interpretation for the discussion. Tables, graphs and figures should be numbered in the order in which they are cited in the text.

Discussion: The discussion should provide an interpretation of your results. Only include theory that relates directly to the lab experiments. Be concise. Keep discussion relevant to the data generated from your own experiment (and that of your classmates when appropriate). Incorporate into your discussion the answers to any relevant questions that appear in the lab manual. In a couple of sentences, draw a conclusion based on the results of the experiment.

Appendix: Include raw data, calculations and other information that is relevant. Remember to number your appendices and include a basic title for each.

References: Laboratory reports must be referenced following the format of the Journal of Molecular Biology. This is the same format we use in the lab manual.

Please note: A lab report submission consists of both a hard copy and electronic copy. Hard copies of reports are to be submitted to the instructor by 4:00 pm on the designated due date. The electronic copy is to be uploaded to Turnitin by 11:59 pm on the due date. Late lab reports (either the hard copy or the electronic copy):
• will be penalized 10% per day and 15% over the weekend
• received following a long weekend will be penalized 25% (15% for Saturday and Sunday plus 10% for the additional day)
• will not be accepted after one week following the designated due date

University Policy on Academic Integrity

Suspected cases of plagiarism or cheating will be documented and submitted to the department chair for penalty assessment as described in the UVic calendar (2013-2014).

Plagiarism

A student commits plagiarism when he or she:
• submits the work of another person as original work
• gives inadequate attribution to an author or creator whose work is incorporated into the student's work, including failing to indicate clearly the inclusion of another individual's work
• paraphrases material from a source without sufficient acknowledgement as described above

Falsifying Materials Subject to Academic Evaluation

Falsifying materials subject to academic evaluation includes, but is not limited to:
• fraudulently manipulating laboratory processes, electronic data or research data in order to achieve desired results
• using work prepared by someone else and submitting it as one’s own
• citing a source from which material was not obtained
• using a quoted reference from a non-original source while implying reference to the original source
• submitting false records, information or data, in writing or orally

Cheating on Assignments, Tests and Examinations

Cheating includes, but is not limited to:
• copying the answers or other work of another person
• sharing information or answers when doing take-home assignments, tests and examinations except where the instructor has authorized collaborative work
• having in an examination or test any materials or equipment other than those authorized by the examiners

Collaborative Work (Penalties) * See below for details specific to this course.

In cases in which an instructor has provided clear written instructions prohibiting certain kinds of collaboration on group projects, instances of prohibited collaboration on a substantial part of the assignment should result in a grade of zero for the assignment, while instances of prohibited collaboration on the bulk of the assignment should result in a grade of F for the course.

* In BCMB 406B, it is required that all assignments and lab reports be written up independently. Collaborative work is only allowed in specific situations when students are directed to share data by the instructor. Students can discuss thoughts and ideas
with other students but all written work must be original. Be sure to submit work that is entirely your own.
Safety Regulations

Work in a microbiology laboratory involves exposure to living microorganisms, many of which must be considered as potential pathogens. Personal recognition of safety and the acceptance of certain precautions are therefore necessary prerequisites to working in the laboratory.

1. **Access to the laboratory is limited to instructors and students.**

2. **No eating, drinking or smoking in the laboratory.** Keep paper, pencils, fingers, and other objects out of the mouth.

3. **Safety glasses must be worn at all times.**

4. **Laboratory coats must be worn and properly fastened by all personnel working in the laboratory and must not be worn in public places.** Laboratory coats will be provided for you and will be shared between sections. If you would prefer a lab coat of your own, you will need to bring one to your first lab section. It will be kept in the lab until the end of the course, at which time it will be autoclaved and available for pick-up.

5. **Open-toed shoes or sandals should not be worn and bare legs are not allowed.** Capri pants, skirts and shorts are only allowed if they cover the knees when you are sitting down.

6. **Lab doors and windows must be closed when working with Level 2 organisms.**

7. **Personal items (coats, bags, etc…) must be kept away from the work area.**

8. **Wash hands before and after completing all lab work.**

9. **Long hair must be tied back** to protect against burning and falling into stains, chemicals or bacterial cultures.

10. **Gloves must be worn in the following situations:**
    - Working with Level 2 organisms
    - Working with potentially harmful reagents
    - If you have open cuts or abrasions on your hands

11. **Gloves and lab coats are not to be worn outside of the lab.**

12. **Remove gloves when working with communal equipment and computers.**

13. **Bunsen burners are to remain off when not in use.**

14. **Dispose of all liquids into the designated waste containers.** No liquids are to be poured down the sink (except water).

15. **Contaminated liquid waste must be autoclaved prior to disposal.**
16. **Dispose of infectious solid waste in the yellow biohazard buckets for autoclaving.** This includes pipette tips, agar plates, contaminated gloves or paper towels, etc.

17. **Report any accidents or safety concerns to an instructor immediately.**
   - If skin comes into contact with chemicals, wash immediately with cold running water for at least 10 min.
   - In the event of a bacterial spill, pour an equal volume of bench disinfectant on top of the spill and allow it to sit for five minutes. Clean up the spill wearing gloves and using a no-touch technique. Discard all waste in a yellow biohazard bucket for autoclaving. **WASH YOUR HANDS with hand disinfectant and soap.**
   - Do not pick up broken glass. The instructor will do this.
   - If something has splashed in your eyes, rinse them at the eye wash station for at least 20 min.

18. **Mouth pipetting is prohibited.** A safety bulb or pipettor must be used.

19. **Sitting on laboratory work surfaces is prohibited.**

20. **Use of cellular devices is not allowed in the lab.**

21. **Note the location of the following safety equipment:**
   - Eye wash station
   - Safety shower
   - Fire extinguisher
   - Telephone
   - Fire alarm

22. **Before leaving the laboratory:**
   - Place all cultures and other contaminated materials to be discarded in the appropriate containers for sterilization in the autoclave
   - Put your experimental materials (**labeled!**) in the appropriate bins or racks for incubation or storage
   - Place contents of “tip discard” and used microfuge tubes into yellow biohazard bucket
   - Rinse all glassware and place in the appropriate bin(s)
   - Check that gas, water and microscope lights are turned off
   - Wash the bench top with bench disinfectant
   - Wash your hands thoroughly with hand disinfectant and/or soap
Building Evacuation in Case of Fire

If you discover a fire:
- Activate the nearest fire alarm pull station.
- Call 911 and Campus Security Services at 7599. State your name and location.
- Evacuate the building.

If you hear a fire alarm:
- If possible secure equipment and close windows and doors.
- Follow the established evacuation route. Do not use elevators.
- Meet at your designated Emergency Evacuation Site.
- Do not re-enter the building until permission is given by the Fire Department.

If you cannot evacuate:
- Close the doors between you and the fire.
- If possible call 911 and advise the Fire Department of your situation.
- Hang clothing or a cloth from a window to alert emergency response personnel.

Earthquake Evacuation Procedures

During an Earthquake:
- Get away from windows and heavy objects.
- Duck, cover and hold on. Crouch low to the ground; protect head with your arms; seek cover under and hold onto heavy furniture. Watch for moving objects.
- If you are in an interior hallway, stay there and crouch against the wall. Watch for swinging doors.

After an Earthquake:
- After the shaking stops wait 60 seconds then evacuate the building. Do not use elevators.
- Make your way to the UVic Campus Assembly Area (playing fields) via safe routes for further information. Keep away from power lines and buildings to avoid falling debris.
- Report any injuries to Campus Security Services.
Biochemistry and Microbiology
Laboratory Acknowledgement Form

NAME___________________________________________________________

COURSE_________________________________________________________

LAB INSTRUCTOR__________________________________________________

Experiments conducted in a Microbiology and Biochemistry laboratory involve the handling of pathogenic organisms. Failure to handle and dispose of these organisms correctly may lead to infection, injury or even serious illness. For the safety of everyone, it is required that you understand and follow the appropriate laboratory procedures as outlined by your laboratory instructor.

Your signature below is your acknowledgement that you have read the safety regulations and agree to abide by them.

__________________________________________________________________

STUDENTDATE