Bio12: Cell Structure and Function
Spring 2017

Room 100, Oopik Auditorium, Class of 1978 Life Sciences Center (LSC)

Professors Sharon E. Bickel, Ph.D. and Bing He, Ph.D.
Laboratory Directors: Amanda Socha, Ph.D. & Nicholas Sylvain, Ph.D.
Teaching Fellow: Kevin Stanko, ’16
Graduate Teaching Assistants: Wei Chen, Liviu Cengher, Stefan Katharios, Thomas Loreng, Adrienne Mehalow, Lauren Panzera

COURSE GOALS & LEARNING OBJECTIVES

1. **Become conversant in Cell Biology.** This will involve learning a vocabulary relating to this field of study and using this vocabulary correctly. Developing a complete vocabulary is necessary to discuss cellular processes accurately. Moreover, having information readily available in one's mind is required in order to quickly make mental connections that lead to new insights and facilitate problem solving.

2. **Understand the experimental methods used to study cells.** We will discuss a broad range of techniques including different types of microscopy, biochemical and molecular analysis, and genetic approaches—all of which are routinely used by scientists to dissect how cells function. You will need to develop a thorough understanding of the underlying theory as well as the technical application of these techniques. A solid background in this area will allow you to apply this information to a diverse set of circumstances, including interpretation of experimental data and the ability to propose new experiments to answer specific questions.

3. **Gain a working knowledge of cellular organization and function.** Our work in this course will allow you to gain a mastery of membrane structure and function and how cellular compartments are formed, how cells generate and utilize energy, how proteins are trafficked to the correct location and/or organelle within the cells, how cells respond to their environment, how signaling pathways within the cell elicit specific cellular responses, how cytoskeletal components are assembled and how they regulate cell shape and motility, how the cell duplicates and divides, how cells are organized into tissues, and how disruption of many of the above cellular processes can lead to cancer.

4. **Develop the analytical skills of a Cell Biologist.** Cell Biology is a science and we will be asking you to think like scientists, whether it be critical analysis of data or the execution and/or interpretation of a scientific experiment. Furthermore, you will gain experience approaching cell biology as a problem-solving endeavor in which you interpret microscopic images and/or utilize your knowledge of the mechanistic details of cellular process. Class discussion and exam questions will give you the opportunity to take what you have learned about a normal cellular process and predict a logical outcome when specific parameters are altered (i.e. by experimental manipulation, mutation, drugs).

5. **Discover the inner beauty of the cell.** Cells are incredibly complex but also innately beautiful. Throughout the term you will frequently be viewing amazing images (and movies!) generated by diverse microscopy techniques. Even without a molecular understanding of how cells work, one can appreciate their beauty. Learning about their structure and function adds an extra dimension to this beauty.
How do we view cells?
1. M 3/27  Course Logistics & Introduction to Cell Architecture  Chapter 1
2. W 3/29  Microscopy (SEB)  Chapter 18
3. Th 3/30  Microscopy (SEB)  Chapter 18

How do we analyze cells?
5. M 4/3  Experimental Approaches (BH)  Chapter 18
6. W 4/5  Experimental Approaches (BH)  Chapter 18
Th 4/6  Optional Review/Q & A

How are cell compartments built?
7. F 4/7  Thermodynamics & Enzymes (BH)  Chapter 3
8. M 4/10  Membrane Structure and Composition (SEB)  Chapter 4
9. W 4/12  Transport Across Membranes (SEB)  Chapter 4
10. Th 4/13  Transport Across Membranes (SEB)  Chapter 4
F 4/14  Optional Review/Q & A
M 4/17  EXAM 1, 8:00-9:55 AM, Lectures #1-10 (including Chemistry)

How do cells generate and utilize energy?
11. W 4/19  Glycolysis & Aerobic Respiration (BH)  Chapters 3, 5
12. Th 4/20  Photosynthesis (BH)  Chapter 6

How do proteins know where to go in the cell?
13. F 4/21  Protein Sorting (SEB)  Chapter 8
14. M 4/24  Protein Sorting (SEB)  Chapter 8
15. W 4/26  Protein Sorting (SEB)  Chapter 8
Th 4/27  Optional Review/Q & A
Th 4/27  Online Quiz—Material through 4/26

16. F 4/28  Protein Sorting (SEB)  Chapter 8

How do cells receive, integrate and process information?
17. M 5/1  Cell Signaling (BH)  Chapter 15
18. W 5/3  Cell Signaling (BH)  Chapter 15
19. Th 5/4  Cell Signaling (BH)  Chapter 15
F 5/5  Optional Review/Q & A
M 5/8  EXAM 2, 8:00-9:55 AM, Emphasis on Lectures #11-19

How do cells regulate cell shape and motility?
21. Th 5/11  Cytoskeleton – Actin (SEB)  Chapter 9
22. F 5/12  Cytoskeleton – Actin (SEB)  Chapter 9
23. M 5/15  Cytoskeleton – Microtubules (SEB)  Chapter 9
24. W 5/17  Cytoskeleton – Microtubules (SEB)  Chapter 9
Th 5/18  Optional Review/Q & A

Review Chemistry ppt slides on Canvas before 3/31/17 class
Th 5/18  Online Quiz—Material through 5/17

How do cells duplicate?
25. F 5/19  The Cytoskeleton in Action during Cell Division (BH)  Chapter 14
26. M 5/22  The Cell Cycle (BH)  Chapter 14
27. W 5/24  The Cell Cycle (BH)  Chapter 14

How do cells form tissues?
28. Th 5/25  Connections between Cells (BH)  Chapter 7

What happens when cell biology “fails”?
29. F 5/26  Cancer (BH)  Chapter 16

M 5/29  MEMORIAL DAY -- no class

Final Exam Review Session ➔ TBA
FINAL EXAM, Sunday, June 4: 8:00-11:00 AM, Emphasis on Lectures #20-29

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We are instituting a no computer use policy for Bio12 this term. We will discuss the rationale for this policy in class. Please do not use laptops or other electronic devices in class. The only exception will be the use of cell phones for “communicating” your answers to “clicker” questions (see below). At all other times, your cell phone should remain face down on your desk or put away.

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Professor Bickel’s OFFICE HOURS:
Wednesdays 4-5 PM, Thursdays 1:30-2:30 PM
LSC 237 (my office) or 238 (the conference room close to my office)

Professor He’s OFFICE HOURS:
Tuesdays 11 AM – 12 PM, Friday 1:30 – 2:30 PM
LSC 350 (my office)

Note that we are generally available to answer questions after lecture.
The scheduled review/Q&A sessions are also good times to have your questions answered.

Note to Students with Physical or Learning Disabilities:
We encourage students who may need disability-related academic adjustments to see one of us (Professor Bickel or Professor He) privately as early as possible in the term, preferably before the end of the first week. Students requiring disability-related academic adjustments or services must contact the Student Accessibility Services (SAS) office (301 Collis Student Center, student.accessibility.services@dartmouth.edu). Once SAS has authorized adjustments or services, we will need to view the originally signed SAS Services and Consent form and/or a letter on SAS letterhead. If you have questions about whether you qualify to receive academic adjustments or services, please contact the SAS office directly. All discussions will remain confidential.
Religious Observances:
Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in this course, please speak with one of us as soon as possible to discuss appropriate accommodations.

EXPECTATIONS

Here’s what we expect from you:
1) To preview the powerpoint slides before class
2) To come to every class, mentally prepared to think about Cell Biology
3) To be willing to ask questions and participate in class discussions and exercises
4) To listen to pre-lecture recordings BEFORE class, when required
5) To utilize active learning techniques to master course material
6) To arrive to laboratory exercises on time, and prepared
7) To use your cell phone during class ONLY for course related activities

Here’s what you can expect from us:
1) To bring expertise and enthusiasm to the classroom
2) To be willing to answer questions and facilitate classroom discussions
3) To challenge you to stretch beyond your comfort zone
4) To encourage you to try new approaches for studying and learning that are “active”
5) To provide opportunities for you to practice problem solving

TEXTBOOK

Cell and Molecular Biology: Concepts and Experiments, by Gerald Karp, 7th or 8th Edition
(Two copies of the 7th edition have been placed on reserve in Dana library, 37 Dewey Field Rd).

An important note about the textbook: We are not requiring that you purchase the textbook. Exams will only cover material presented in class. The textbook can be used as a reference to help clarify your understanding of material we discuss in class. Some students find this very helpful, other students don’t use the textbook at all. In deciding whether or not to purchase the textbook, consider what study strategies are most productive for you. Also, if you intend to apply to med school, vet school or graduate school then you may find having the textbook will be useful as a familiar source of information when you begin to review what you have learned in preparation for the MCAT or GRE exams.

Additional Textbooks on Reserve: For those wishing to supplement the lectures with reading from additional textbooks, the following are also on reserve in Dana Library. All reading in the following textbooks is optional.

Essential Cell Biology, 3rd edition (2009) by Alberts et al. This text has been the Bio12 textbook in past years but is in many ways too simplistic. If you need more background before diving into Karp, try this book.

Molecular Cell Biology, 7th edition (Dartmouth Custom Book) (2013) by Lodish et al. This textbook contains more material than Karp. Some students find the additional level of detail in this textbook useful.
METHODS OF ASSESSMENT AND GRADES

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>22%</td>
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<td>Exam 2</td>
<td>22%</td>
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<tr>
<td>Final Exam</td>
<td>22%</td>
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<tr>
<td>Lab grade</td>
<td>25%</td>
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<tr>
<td>Quizzes</td>
<td>6%</td>
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<tr>
<td>Participation</td>
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Exams will be an even mixture of testing your mastery of the information and applying your knowledge to problem solving.

Barring documented illness, family emergency or academic conflict, **failure to take an exam at the scheduled time will result in a grade of zero**. Documentation of illness requires that you contact Dick’s House and determine if you need treatment. You must alert either Professor He or Professor Bickel in advance of the exam if you are unable to take the exam at the scheduled time.

FACILITATING YOUR LEARNING PROCESS

Several lines of evidence indicate that certain activities promote learning and retention MUCH better than re-reading your notes. If you would like to learn more about the most effective strategies for studying and learning (and the research underlying these recommendations), we highly recommend the book *Making it Stick: The Science of Successful Learning* by Brown, Roediger III, and McDaniel. Kevin Stanko, the Teaching Fellow, has read this book and is happy to talk about its contents, and how to use these strategies in Bio 12.

**Online Quizzes**

One effective study strategy is called “retrieval practice.” The actual act of retrieving information (like during a quiz) helps you to solidify your knowledge/memory and enhances your ability to retrieve the information in the future. We encourage you to build retrieval practice into your study routine. To further facilitate the advantages of this strategy, we will administer three low-stakes on-line quizzes during the term, each scheduled ten days before an exam.

We are hoping that this will provide you with at least three benefits: 1) you will not be able to put off studying (cramming) until the exam; 2) your learning and retention will actually be strengthened by having to practice retrieval during the quiz and 3) you will get some feedback about areas on which you need to focus more time/effort.

**Participation Grade**

Another effective study strategy utilizes “reflection” as a method to retrieve information and place it within context. Therefore, during the last few minutes of each class we will ask you to write down what you think were the ~2-3 most important take away messages and also to write down 2-3 points that you found confusing.

Why are we doing this? 1) We want to encourage and reward class attendance; 2) there is a benefit to immediate reflection on each lecture experience and 3) by obtaining immediate feedback on what points were most confusing we can revisit these points in the following lecture and/or review sessions.

Class participation will begin on Wednesday March 29, for a total of 28 lectures. Participation points will be tiered depending on your attendance:

- Attendance at 25-28 lectures → 3 points (full credit)
- Attendance at 20-24 lectures → 2 points
- Attendance at 15-19 lectures → 1 point
- Attendance at 0-14 lectures → zero points
Clicker Questions
We will be utilizing an interactive technology in Bio12 that will allow you to use your cell phone to communicate your answer to clicker questions that we will pose in class throughout the term. One purpose of using clicker questions is that it allows us to gauge your understanding in real time. The best way for us to gain an accurate appraisal is if the majority of the class answers each of the clicker questions. Additionally, research has demonstrated that clicker questions help students to actively engage with the course material, and this facilitates learning and synthesis. You will be “clicking” anonymously—we will not see what answers you give. The data will be tabulated for the group, not for individual students. Although your grade will not depend on clicker question participation, we hope all of you will participate fully throughout the term. We will be using a technology that allows cell phone use specifically so that you will not have to purchase a clicker to participate.

Grading Policy For Exams:
The following points summarize the grading procedures with respect to exams:

1. After the exam has been graded and returned, a copy of the answer key will be posted on the Bio12 Canvas site. Review this answer key and be sure to understand the errors in your exam and why you made them.

2. The number of points given for each answer is final. If, after reviewing your answers and comparing them to the posted answer key before the deadline (see below), you find an arithmetic error or detect an omission by the grader for one of the questions, you must observe the following procedures for error correction:
   a) Do not write on the exam. Any alteration of the answers between the time when the graded papers were returned to the student and the time when the paper was submitted for re-grading constitutes a breach of the Academic Honor Principle. To deter this practice, we scan exams before grading them.
   b) Prepare a typed cover page with your name and HB number.
   c) If you find an addition error, indicate on the cover page that an addition error has occurred. Specify the page and question number.
   d) If you determine that your answer contains all of the information indicated in the key, but you did not receive full credit, simply indicate the number of the question to be re-evaluated and state in one or two short, descriptive sentences (typed) what makes your answer correct. The citation of a text page, diagram, or reference to a lecture date/number may also be helpful.
   e) Attach the typed cover sheet to your complete exam and return it before the announced deadline to the Bio12 drop box located outside the lab (LSC 202).

EXAM Error correction requests:
must be hand-delivered to the Bio12 drop box before these deadlines:
   First Exam: 12:00PM (Noon) on May 3
   Second Exam: 12:00PM (Noon) on May 24

We will not accept questions regarding errors in grading after these deadlines.

The error correction process will take a few days. You will be notified of the place and time to pick up exams after the re-evaluation is completed.
A final word about grades and exams:
You are not competing against each other for grades in Bio12. We want to be very clear about that and reiterate this point: You are not competing for grades in this class with anyone but yourself. All grades, up until the final letter grades are decided, are recorded as numerical grades, from 0% to 100%. We do NOT assign letter grades to individual exams. Here are three important points about grades in Bio12:

[i] A grade of 90% or above will always be at least an A minus No one is ever penalized for learning what we teach them. Thus, it is entirely possible for everyone in the class to receive a grade of A minus or better. However, our experience suggests to us that this will not happen.

[ii] In order to receive a D, you have to achieve a final grade of at least 50%. In other words, a final grade less than 50% is an E.

[iii] The median grade of Bio12 will mostly likely be a B. That means if the median numerical score for the course were 62%, then a grade of 62% is a B. If the median were 29%, then a grade of 29% is a B (hence negating rule [ii] above). If the median numerical score is 94% then the median letter grade for the course will be an A or A- (see rule [i] above).
HOW TO BE SUCCESSFUL IN BIO12

Please also see the powerpoint entitled “Strategies for Success in Bio12” which is posted on Canvas

1) Print out and Preview the powerpoint slides before class. Look at the figures and get a general feel for the vocabulary to be introduced and the topics to be covered in the upcoming lecture. Jot down any questions you have to focus your attention in lecture.

2) Attend lectures on time (class will start promptly at 8:50 AM), take notes on the material presented in lecture, and ask questions about the things you do not understand. If you print out the powerpoint slides, you can easily make notes, draw arrows, circle items, etc. on the actual slide. This is an example of “active” learning that is much more effective than typing your notes on your computer.

3) Review your notes that very same afternoon or evening after the lecture, when it is still fresh in your mind. Correct or add points to your notes as you go along. Re-writing your notes and redrawing figures is an excellent “active” method for “learning” the material.

4) Use the textbook to fill in gaps in your notes and/or clarify topics discussed in class. Exams will be based on information covered in class, NOT details in the textbook that we do not discuss in class.

5) Be curious and ask questions in class, in office hours, in lab and with fellow students. Also ask YOURSELF questions and try to challenge yourself to decide if you really understand the material.

6) Test your own knowledge by putting away your notes and drawing out structures and pathways from memory. Your goal is to be able to accurately re-create the details and mechanisms from scratch. Don’t just try to do it in your head. Do it on paper, and then compare your attempt with your notes. This is the essence of practicing “retrieval.”

7) Practice applying information to new situations. What would happen to pathway X if factor A is missing from the cell?

8) Attend office hours and the scheduled review sessions and don’t be shy about asking questions.

RESOURCES FOR ASSISTANCE WITH CLASS MATERIAL

1) Class recordings: While technology may not be 100% reliable, our plan is to provide recordings of the lectures available on the Canvas site.

2) Class review sessions: We have scheduled several class meetings to include time for review and Q&A. Plan to come to these class meetings with specific questions to ask.

3) Piazza Discussion on Canvas: There will be a link on the Canvas site where you may post questions about class material (anonymously if you wish) and these questions will be answered so everyone can see the answers and also learn. We encourage students to “dialogue” about course material using this forum. Individual email questions about lecture material will not be answered.

4) Course Teaching assistants: The Bio12 TAs are Ph.D. students in the Molecular and Cellular Biology graduate program and an excellent resource for information. They will be attending the lectures and be familiar with the material.

5) Kevin Stanko, ’16, will serve as a Teaching Science Fellow for Bio12 this term. He will be hosting bi-weekly review sessions (Th 7-9 PM, Sun 7-9PM), providing supplementary study material for the course, and acting as a peer-mentor resource for the class to help with mastery of material. Feel free to contact him with questions or concerns about the course, or to set up a time to meet individually or in small groups.

6) Join a study group through the Academic Skills Center or form your own.
ACADEMIC HONOR:

The Dartmouth College Student Handbook states "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth."

There are a number of situations in which a student in Bio12 might find themselves tempted to violate the Academic Honor Principle. These situations include (but are not limited to) the following:

a) Examinations must be completed without reference to materials other than those provided with the exam paper and must be completed without communication with anyone else, including the internet (the only permissible exception is that students may request clarification of any exam question from the course instructor who is present expressly for that purpose). The answers that you provide must be entirely your own work.

b) Our policy permits the re-submission of exams for potential error correction by the instructor. Any alteration of the answers between the time when the graded papers were returned to the student and the time when the paper was submitted for re-grading constitutes a breach of the Academic Honor Principle. To deter this practice, we scan exams before grading them.

c) On-line quizzes are to be completed by each student independently. A major goal of the quiz is to give you an opportunity to practice the retrieval of information. Research shows that the act of retrieval actually enhances learning by embedding information more securely in our memory. Therefore, students must complete all on-line quizzes without referring to any materials (no textbook, no notes, no internet, no outside sources of any kind, no conversation with anyone). The answers that you provide must be entirely your own work.

d) Science is a collaborative field and we encourage collaboration for many aspects of the course while still requiring demonstration that each individual has an understanding of key concepts. You will work with a partner during the laboratory sessions to perform all in-lab activities including microscopy, data collection, and hypothesis generation. We encourage you to collaborate with your partner and peers in the analysis of your data, including discussion of data presentation and interpretations. While the ideas and overall interpretations may result from collaboration, we require that the textual and graphical content of any lab report submitted for grading be prepared by you individually without the assistance of anyone else.

e) Your participation grade will be based on your reflection at the end of the class period and submission of a written document. It is a violation of the Honor Principle to have a friend submit a reflection document for you or for you to submit a document for your friend.

Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, the faculty will not overlook any violations of the Academic Honor Principle. Indeed, the Faculty Handbook of Dartmouth College states explicitly that College faculty are obligated to report potential violations of the Academic Honor Principle to the Dartmouth College Committee on Standards.
BIO12 CELL STRUCTURE AND FUNCTION LABORATORY SYLLABUS

SPRING 2017

Welcome to the laboratory of Bio12! This portion of the course will complement the lecture by offering you the opportunity to engage in the scientific process within the field of cell biology. The specific laboratory objectives for Bio12 are:

1. Using an array of microscopy techniques, students will critically observe both live and fixed cells to analyze cell structure and function.

2. Students will integrate data from multiple biochemical assays to yield conclusions regarding the interplay of cellular components.

3. Students will engage in the process of scientific inquiry by generating hypotheses, developing study designs, collecting data, and interpreting results. Written laboratory reports will be culminating assignments to display proficiency in communicating scientific ideas and findings.

This syllabus outlines the material that will be covered this term, important dates, and laboratory policies. We will review this syllabus during your first laboratory session. However, it is your responsibility to be familiar with all parts of this syllabus and to follow them closely. Please refer back to this document throughout the term.

LABORATORY PERSONNEL

Laboratory Director
Dr. Amanda Socha Amanda.L.Socha@dartmouth.edu
Dr. Nicholas Sylvain Nicholas.R.Sylvain@dartmouth.edu

Graduate Teaching Assistants
Wei Chen Wei.Chen.GR@dartmouth.edu
Liviu Cengher Liviu.Cengher.GR@dartmouth.edu
Stefan Katharios Stefan.G.Katharios-lanwermeyer.GR@dartmouth.edu
Thomas Loreng Thomas.D.Loreng.GR@dartmouth.edu
Adrienne Mehalow Adrienne.K.Mehalow.GR@dartmouth.edu
Lauren Panzera Lauren.C.Panzera.GR@dartmouth.edu
**Laboratory Section Assignment**

On the first day of class you will be directed to fill out an online survey to determine your lab section based on your academic schedule. Conflicts of an academic nature will take priority, followed by work and extracurricular activities. Your lab section assignment will be the same for the entire term and it is your responsibility to ensure that you will be in attendance for all sessions. Be sure to check all exams and X-hours for your other classes throughout the term. This term we will be offering six lab section times:

- Section 1: Monday 1:30-5:30pm
- Section 2: Monday 6:00-10:00pm
- Section 3: Tuesday 1:30-5:30pm
- Section 4: Tuesday 6:00-10:00pm
- Section 5: Wednesday 1:30-5:30pm
- Section 6: Wednesday 6:00-10:00pm

**Laboratory Calendar**

Below is a calendar outlining each laboratory session for the term and relevant assignment due dates. This calendar will also be available electronically through Canvas and can be integrated together with your other courses for the term. Be sure to check the Canvas calendar regularly throughout the term for any changes to this calendar.

<table>
<thead>
<tr>
<th>Lab</th>
<th>Date</th>
<th>Assignment</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Lab 1 – Microscopy</td>
<td>April 3 – 5</td>
<td>In-lab microscopy assignment</td>
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<tr>
<td>Laboratory Quiz</td>
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<tr>
<td>Lab 2 – Ion Chromatography</td>
<td>April 10 - 12</td>
<td>Ion Chromatography Assignment</td>
<td>In Lab 3 (week of April 23)</td>
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<tr>
<td>Laboratory Quiz</td>
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<tr>
<td><strong>No Lab April 17 - 19</strong></td>
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<tr>
<td>Lab 3 – Gel Electrophoresis</td>
<td>April 24 – 26</td>
<td>Protein Gel Assignment</td>
<td>In Lab 4 (week of April 30)</td>
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<tr>
<td>Laboratory Quiz</td>
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<tr>
<td>Lab 4 – Hill Reaction</td>
<td>May 1 – 3</td>
<td>Lab Report</td>
<td>In Lab 5 (week of May 14)</td>
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<td>Laboratory Quiz</td>
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<td><strong>No Lab May 8 - 10</strong></td>
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<tr>
<td>Lab 5 – Cell Motility</td>
<td>May 15 - 17</td>
<td>Lab Abstract</td>
<td>In Lab 6 (week of May 21)</td>
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<tr>
<td>Laboratory Quiz</td>
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<tr>
<td>Lab 6 – Experimental Design</td>
<td>May 22 – 24</td>
<td>Lab Report</td>
<td>May 28 – 30 (six days after your lab section)</td>
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LABORATORY GRADES

Your work in the laboratory will contribute to 25% of your overall grade in Bio12. The lab grade will be composed as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Lab Quizzes</td>
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<tr>
<td>In-Lab Microscopy Assignment (Lab 1)</td>
<td>5%</td>
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<tr>
<td>Chromatography Assignment (Lab 2)</td>
<td>15%</td>
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<tr>
<td>Protein Gel Assignment (Lab 3)</td>
<td>10%</td>
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<tr>
<td>Chloroplast Report (Lab 4)</td>
<td>15%</td>
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<tr>
<td>Cell Motility Abstract (Lab 5)</td>
<td>5%</td>
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<tr>
<td>Experimental Design (Lab 6)</td>
<td>5%</td>
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<tr>
<td>Experimental Design Report (Lab 6)</td>
<td>20%</td>
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ASSIGNMENTS

You are required to prepare your assignments electronically and submit a hard copy of the assignment at the beginning of your laboratory session. Printing problems are not an acceptable excuse for lateness so plan your assignment printing in advance.

Lab Assignment Grading Error Correction Requests

All of your laboratory assignments are graded carefully and conscientiously. If you identify arithmetic or omission errors by the grader after reviewing your graded assignment, you must observe the following procedure to correct the error.

1. Do not write on the assignment. Assignments that have been written on will not be reviewed. Any alteration to the assignment following the original submission will be considered a violation of the Academic Honor Principle.

2. Prepare a typed page with your name and HB number and outline the grading error(s) you have identified.

3. If you find an addition error, indicate which page of the assignment has the error.

4. If you determine that your assignment contains the requisite information to satisfy a grading comment but did not receive full credit, indicate which grading comment you are referring to and which section of your assignment satisfies the comment.

5. Submit your grading error correction request, comprised of the cover page, grading error description, and original hard copy assignment, in the Bio DropBox outside of
LSC 202 by the designated deadline. Grading error correction requests submitted after this time will not be accepted.

- Lab 2 Chromatography Assignment: due by noon on Monday, May 8
- Lab 3 Protein Gel Assignment: due by noon on Monday, May 15
- Lab 4 Chloroplast Report: due by noon on Monday, May 22

**Academic Honor Principle**

As stated in the Dartmouth College Student Handbook, “Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth.”

Part 2 of the Academic Honor Principle indicates that it is the responsibility of the faculty to “(a) provide continuing guidance as to what constitutes academic honesty, (b) to promote procedures and circumstances which will reinforce the principle of academic honor; and (c) to review constantly the effective operation of this principle.”

In line with these obligations, we have outlined below how the Academic Honor Principle is applied to the laboratory portion of your Bio12 course work.

- Science is a collaborative field and we encourage collaboration for many aspects of the course while still requiring demonstration that each individual has an understanding of key concepts. You will work with a partner during the laboratory sessions to perform all in-lab activities including microscopy, data collection, and hypothesis generation. We encourage you to collaborate with your partner and peers in the analysis of your data, including discussion of data presentation and interpretations. While the ideas and overall interpretations may result from collaboration, we require that the textual and graphical content of any assignment or lab report submitted for grading is prepared by you individually without the assistance of anyone else.

- Frequently you will search the scientific literature in order to find support for your hypotheses or data interpretations. It is critical to cite all references used. We require that you use the citation style of Cell, available at [http://www.cell.com/cell/authors](http://www.cell.com/cell/authors). For extensive lab reports, it is recommended that you use a reference manager program (ie. RefWorks, Papers, Endnote). Help with these is freely available to you through the Dana Biomedical Library.

- Any attempt to mislead the laboratory instructor, TA, or other course personnel regarding late submission of assignments, absences from lab, or alterations in graded assignments will be considered academic dishonesty and will be considered a violation of the Academic Honor Principle.
LABORATORY POLICIES

Attendance

Attendance is required at ALL of your assigned lab dates. It is your responsibility to ensure that you are in attendance for all of your assigned laboratory sessions for the entirety of the laboratory period.

If you are unable to attend your assigned lab section due to unforeseen circumstances, you must notify the laboratory directors as early as possible, before your assigned lab section time. The earlier you bring this to the attention of laboratory directors the greater the possibility that arrangements can be made for you to still complete all or portions of the laboratory activities. Due to time constraints, however, there are no arrangements for make-up labs and there is no guarantee you will be able to participate in or receive full credit for the lab.

Attire

We will routinely be working with hazardous chemicals and laboratory equipment. Therefore it is critical that you come to the laboratory with appropriate attire to perform all laboratory procedures safely. You are required to wear closed-toe shoes and long pants or ankle-length skirts at all laboratory sessions. Shorts, capris, skirts above the ankle and sandals are not allowed. During the winter months, it is recommended to bring dry shoes to avoid slipping in wet boots. Arrival at the laboratory with inappropriate attire will result in you being sent home to acquire the appropriate lab attire.

We will provide lab coats, gloves, and goggles when necessary. The purpose of this personal protective equipment is to prevent the contamination of you and your belongings, therefore please remove all lab coats, goggles, and gloves if you leave the laboratory, (including going into the lab vestibule) for any reason during the laboratory session.

Electronic Devices

Due to the nature of the reagents and equipment used in the laboratory, it is critical that electronic devices are not used during the laboratory sessions. Cell phones are not permitted in the laboratory at any time and must be kept in the vestibule during the entire laboratory session. Laptop computers are permitted only during designated times (as indicated by your TA) and can only be used in designated areas to avoid contamination with hazardous reagents.