If you strive to think and communicate like a scientist in your work throughout the semester, in the end, you will be a scientist and really know biology (Think like a serious scientist, not like a pretend one).

LECTURER
Douglas B. Luckie, Ph.D., Associate Professor, Lyman Briggs College & Dept. of Physiology
Holmes Hall Office: W-26D
Phone: 353-4606
E-mail: luckie@msu.edu

TEXTBOOK

COURSE PACKET
LB145 Course Packet [for Dr. Luckie] at Bookstores (includes: syllabus, lab manual, lab notebook, etc)

COURSE WEBSITE  http://msu.edu/course/lb/145

LB-145 = LB-145 (LECTURE) & LB-145L (LAB) OVERVIEW OF CLASSES
There are two overarching goals in these two connected classes.

1.) To gain a fundamental comprehension of the cellular processes necessary for life and an appreciation why it is important to understand these processes.
2.) To learn how to think like a scientist and be able to adaptively negotiate a question or problem.

During the semester we will study the building blocks of cells, the gross anatomy of the cell, and the structures and organelles that perform the work necessary for cell function. We will also examine several cellular processes at the molecular level, including the central dogma of molecular biology: RNA transcription and protein translation. We will examine the bioenergetic processes necessary to sustain life; first photosynthesis, the mechanism by which plant chloroplasts capture light energy to make the carbohydrates that bring life to earth. We then discuss the mitochondria and how they break down carbohydrates to release energy. All topics will be framed within the context of the human physiology. Mastery of these topics will provide you with an understanding of modern molecular and cellular biology.

LECTURE COURSE WORKLOAD
LB-145 is a 5-credit course that consists of two connected classes (lecture 3 credits, laboratory 2 credits) and because it IS two classes it requires twice as many hours of work as one class. Since the lecture is a course worth 3 credits, MSU requires that you work in-class 3 hours each week, and, in addition to the in-class work, for any 3-credit lecture course, MSU expects you to spend 6-9 hours/week outside of class studying and working on assignments. There will be a certain amount of preparation that you and your research group will need to do before each class and reading that you will need to complete (with notes taken) before each lecture. You will be expected to master quite a bit of new material to expand your knowledge of life and science. Come to lecture well-prepared and carefully listen and add additional notes about all the information provided or you will forget things and feel like nobody ever explained it to you.
SCHEDULE
Both the lecture schedule and the lab schedule are found in the subsequent pages. We reserve the right to modify the schedule if necessary. You will be given advance warning if the schedule needs to be changed.

OFFICE HOURS
W-26D Holmes Hall, for 1hr following lecture, and appointments upon request.

ACADEMIC HONESTY
It is your responsibility to know what constitutes cheating. Ignorance is not a defense. Turnitin.com will allow you and your group members to review written assignments prior to submission. If you are caught cheating you may be assigned a “0” for the assignment, or for the entire course. The policy for academic honesty at LBC can be found at http://lbc.msu.edu/current_students/academics/AcademicPolicies.cfm

GRADING
Your grade in LB-145 is based on the total number of points earned in the both the lecture portion (400 points) and the laboratory portion (250 points) of the course. The course will be graded on a flat scale:

4.0= 90-100%  3.5= 85-89.9%  3.0= 80-84.9%  2.5= 75-79.9%  2.0= 70-74.9%  1.5= 65-69.9%  1.0= 60-64.9%  0.0= <60

A “3.0” score is considered Excellent. It is impressive work, top of the class, and the work was done extremely well but nothing beyond what was expected.
A “3.5” is Most Excellent. Every detail of the work was done extremely well and they found additional papers and evidence beyond what they were told.
A “4.0” is Outstanding. It has the 3.0, 3.5-level elements + student impresses instructor with how much/well they did the work. They taught Prof something.

Late Policy: Assignments are due in lab/lecture at the beginning of the session indicated (at time of entering room) unless otherwise specified. If an assignment is 1 day late, 1 point will be deducted from the final score. After this 24 hr grace period, the penalty becomes more severe: 20% off for two days late, 30% off for three days late, and so on. After 5 days, you will receive a “0” for the assignment.

Rejected Manuscripts/Reports: Each time a paper/film is “rejected”, because it did not follow the Instructions to Authors, 1 point is deducted. This is independent of the Late Policy, both can occur.

Blind Grading: Whenever possible we will score assignments "blind" and ask you not indicate your name but just list your B-PID. This enables grading to be more fair and not be impacted by subjectivity etc.

*Formal Written Appeal Process: If you feel that your exam, paper, or quiz was not graded properly you must submit your complaint in writing (on paper, not via email). You must concisely explain why you object to the assigned grade and what elements of your work demonstrate you mastered the material. Please be advised that if you submit a formal grade appeal about one element of an assignment, we always re-grade your entire exam, paper or quiz and the score may increase, decrease or stay the same. For group assignments, all authors must sign the written request. How much and how well you provide evidence to support your argument is assessed and students who provide good logical arguments supported well by solid relevant evidence will earn approval (Claim, Evidence, Reasoning; you may cite pages of textbooks or even better published research papers). Avoid emotional arguments that blame others or arguments based on hearsay, e.g. “A TA told me this was correct.” If you neither make logical arguments or provide thoughtful evidence to support them, your appeal will not gain traction or be approved. All discussion concerning score changes must be completed within 7 days from the date the grade was officially posted (on the returned assignment or online). No grade changes will be considered after this time. If illness or other emergency prevents you from completing assignments on time, you must make arrangements with your instructor before the due date.
LB145: Biology Learning Goals

Our "skills" learning goals are for you to gain practice and excel in these scientific methods:

1. **Design**: Apply science process skills, such as: developing hypotheses, making predictions, and designing experiments to test them (e.g. design an experiment to determine whether it's change in temperature or sunlight that causes leaves to turn red in Fall).

2. **Analyze**: Interpret evidence collected during experiments, looking for patterns and different ways to represent data, and using logical and/or quantitative reasoning to defend or reject hypotheses (claims).

3. **Collaborate**: Confidently cooperate in teamwork, and practice team building, team communication and leadership. (e.g. use techniques like "that's a good idea, OK, how can we improve it even more?" "Jon, you haven't spoken much, what do you think?")

4. **Communicate**: Conversation aimed at a variety of audiences important for scientists: (Ben says: "Their data predicts squirrels will hit light speed!" Jen responds: "But they have zero data at that part of the graph.")
   1) **Speaking**: practice speaking and listening to others in large & small groups.
   2) **Reading**: practice careful and critical reading of text, identification of important points & ideas, as well as slow deliberate reading and interpretation of figures and graphs.
   3) **Writing**: practice composition of text, writing manuscripts, building figures and graphs.
   4) **Thinking**: practice identifying data and evaluating author's evidence-based arguments.

5. **Reflect**: Develop personal learning goals and reflect on your progress throughout the semester. (e.g. regularly consider "OK, what I am supposed to be learning here? Have I mastered that topic? What next?)

Our "content" learning goals are for you to understand, describe, and provide examples of how:
(this semester's topics connected to learning goals you studied previously in LB144 are underlined below)

1. **Evolution** of molecules, organelles, and processes led to the origin of life on the planet earth. (e.g. How is it possible to create carbon-based life on a sterile planet that has none?)

2. Some cells can capture CO2 and transform photonic energy into chemical energy (e.g. ATP) to drive cellular processes and build cellular polymers. (e.g. How does photosynthesis work? How does a chlorophyll pigment molecule capture light energy?)

3. Small organic molecules (nucleotides, amino acids, lipids, carbohydrates) when built into polymers can associate to create cellular surfaces and compartments with which to perform biochemical processes (of life). (e.g. What is a lipid and how is it used to create a cell membrane? When proteins join a membrane does that create intelligence?)

4. Information in DNA -> becomes (transcribed) information as RNA -> becomes (translated) information in the proteins that determine structure. (e.g. How does a cell make insulin? Transcription make mRNA?)

5. Information in the 3D structure of a molecule determines its function (and influences its evolution). (e.g. the CFTR protein is shaped like a roll of toilet paper in the cell membrane, turns out it's an ion channel)

6. Changes in DNA (mutations that lead to new alleles) -> result in changed RNA that may lead to -> changed protein (structure) that lead to changed function. (e.g. What DNA change leads to sickle cell anemia? or How does a three-base deletion result in the disease cystic fibrosis?)

7. _______________________________________________________________________________________
   _______________________________________________________________________________________
# LB-145: Cell & Molecular Biology, Lecture

## Schedule:

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
<th>Reading(s) discussed in lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Tu The course and diseases</td>
<td>CF paper in Course Pack pp.267-274</td>
</tr>
<tr>
<td></td>
<td>Th <strong>Evolution of Life</strong>: What is the heritable material?</td>
<td>Textbook's <em>Foreword</em>, Ch.1-ICB: 1.2</td>
</tr>
<tr>
<td>Week 2</td>
<td>Tu EvoLife: What is Evolution? (molecules in life).</td>
<td>Ch.4-ICB: 4.1, ELSI 4.1</td>
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<tr>
<td></td>
<td>Th EvoLife: Could abiotic molecules form organic?</td>
<td>Ch.4-ICB: 4.2</td>
</tr>
<tr>
<td>Week 3</td>
<td>Tu EvoLife: Can non-living objects compete, store E?</td>
<td>Ch.4-ICB: 4.3(1st half), 4.4</td>
</tr>
<tr>
<td></td>
<td>Th EvoLife: Were organelles once living bacteria?</td>
<td>Margulis; Photosynthesis (OSB): 8.1</td>
</tr>
<tr>
<td>Week 4</td>
<td>Tu EvoLife: What chloroplasts do? (photosynthesis)</td>
<td>Photosynthesis (OSB): 8.2</td>
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<td></td>
<td>Th EvoLife: Where is tree mass from? (photosynthesis)</td>
<td>Photosynthesis (OSB): 8.3</td>
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<tr>
<td>Week 5</td>
<td>Tu EvoLife: Why is Paraquat used? (photosynthesis)</td>
<td>Ch.11-ICB: 11.1</td>
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<tr>
<td></td>
<td>Th EvoLife: Brazil affects glaciers? (photosynthesis)</td>
<td>Ch.11-ICB: 11.2</td>
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<tr>
<td>Week 6</td>
<td><strong>EXAM I</strong>: Evolution of molecules, organelles, photosynthesis</td>
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<tr>
<td></td>
<td>Th <strong>Cystic Fibrosis</strong>: How do people get sick?</td>
<td>CF paper: Rowe et al. <em>NEJM</em> 2005</td>
</tr>
<tr>
<td>Week 7</td>
<td>Tu CF: How do genetic diseases arise?</td>
<td>Ch.5-ICB: 5.1</td>
</tr>
<tr>
<td>Week 8</td>
<td>Th CF: What happens at endomembranes? (cells)</td>
<td>Cell Structure (OSB): 4.4</td>
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<tr>
<td></td>
<td>Th CF: Why aren't there giant cells? (cells)</td>
<td>Ch.8-ICB 8.2</td>
</tr>
<tr>
<td>Week 9</td>
<td>Tu CF: Is passive transport the disease? (membranes)</td>
<td>Plasma Membranes (OSB): 5.2</td>
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<td></td>
<td>Th CF: Is active transport important too? (mems)</td>
<td>Plasma Membranes (OSB): 5.3</td>
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<tr>
<td>Week 10</td>
<td>Tu CF: Breathing/ventilation/circulation</td>
<td>Respiratory System (OSB): 39.1</td>
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<td>Th <strong>EXAM II</strong>: cystic fibrosis, cells, membranes, channels, transporters</td>
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<tr>
<td>Week 11</td>
<td>Tu <strong>Diabetes</strong>: How do people get sick?</td>
<td>Diabetes paper: Polonsky <em>NEJM</em> 2012</td>
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<td></td>
<td>Th Diabetes: How do you break down food?</td>
<td>Ch.23-ICB: 23.1</td>
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<tr>
<td>Week 12</td>
<td>Tu Diabetes: How does DNA shape affect (dogma)?</td>
<td>Ch.1-ICB: 1.4, ELSI-1.1</td>
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<td></td>
<td>Th Diabetes: How to make RNA (central dogma)</td>
<td>Genes and Proteins (OSB): 15.3, 15.5</td>
</tr>
<tr>
<td>Week 13</td>
<td>Tu Diabetes: How does DNA communicate (dogma)?</td>
<td>Ch.2-ICB: 2.1</td>
</tr>
<tr>
<td></td>
<td>Th Diabetes: How does insulin express itself (dogma)?</td>
<td>Ch.2-ICB: 2.4 (insulin &amp; leisure reading)</td>
</tr>
<tr>
<td>Week 14</td>
<td>Tu Diabetes: How is ATP produced (respiration)?</td>
<td>Ch.10-ICB: 10.4</td>
</tr>
<tr>
<td></td>
<td>Th Diabetes: Homeostasis and regulation (respiration)?</td>
<td>Ch.10-ICB: ELSI-10.1, BME-10.1</td>
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<tr>
<td>Week 15</td>
<td>Tu <strong>Cancer</strong>: Pop-up Journal Club</td>
<td>Cancer paper</td>
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<tr>
<td></td>
<td>Th <strong>Gene Therapy</strong>: Pop-up Journal Club</td>
<td>Gene Therapy paper</td>
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<td></td>
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<tr>
<td></td>
<td><strong>FINAL EXAM</strong>: comprehensive (finals week, see msu.edu for schedule)</td>
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</tbody>
</table>
THE LECTURE
ASSIGNMENT SCHEDULE

ATTENDANCE AND PARTICIPATION:
Attendance and participation are worth 80 points. It is essential that you not only come to class but also participate in order to construct your own knowledge. While attendance is "being present" in lecture and lab, participation includes doing the reading and preparing well for class and will often be assessed by in-class clicker questions, or written quizzes and exercises.

A quiz or graded exercise may occur in lecture or lab and are usually based on the reading assignment or topic for that day. These quizzes/exercises are designed to help you assess your own learning between exams and ensure you keep up with the material. They provide you with regular feedback as to how well you are mastering each topic. Quizzes may be written multiple choice or essay-style; some may be performed with your clicker. Exercises may be given as a homework assignment or a problem-solving exercise. The exercises are designed to improve your problem-solving skills and test your ability to apply new concepts.

EXAMS:
There will be two midterm exams (100 points each) and a final exam (120 points) in the course. Midterm exams may be traditional multiple-choice format or may be long essay-style, perhaps with essay questions provided in advance. If you are given essay questions in advance, you are to study and discuss possible answers with your group members but when you write your own individual answer be sure the text is unique and clearly your own words/work. They will often be submitted online to http://turnitin.com/ and as a hard copy at the start of lecture. You then would frequently have in-class closed-book exam where you are required to answer some of the questions (randomly chosen) you studied on the take-home portion.

During final exam week, the written final exam will be comprehensive. Because MSU requires final course grades to be submitted 48 hrs after the final exam is completed, we must use a multiple-choice format. Prior to finals week an optional Verbal Final exam may be offered.

Assignments (pts):
Attendance & Participation (quizzes etc)= 80, Midterms (2)= 200, Final Exam= 120

<table>
<thead>
<tr>
<th>Week</th>
<th>Assignment Due</th>
<th>@ Lec.</th>
<th>Lab</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(all)</td>
<td>Attendance and participation</td>
<td>X</td>
<td>X</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>Exam I (Multiple choice or Essay)</td>
<td>X</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>Exam II (Multiple choice or Essay)</td>
<td>X</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam (Multiple choice or Verbal)</td>
<td>X</td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

Total 400 pts
RESEARCH TEAM RATIONALE
Student groups are intended to be research & learning teams. Work with other students to study and discuss biology topics in lecture, as well as share your ideas and research predictions in lab. Teams are better learning environments but also, they are REAL LIFE. While scientists do some things on their own, they more often work in groups to solve problems because a well-functioning team is the most efficient way to work. Working in the same group in both laboratory and lecture will allow you to become more familiar with each other so you will feel comfortable enough to discuss your biology questions. Although it is easier for an instructor to run a class or lab without group work, numerous research studies have shown that working in groups and discussing science with your peers can increase your learning considerably (although you have to strive to be a “cooperative” group). By pooling your knowledge, members of your group will get “stuck” less often be able to progress far beyond what any individual in the group could do alone.

<table>
<thead>
<tr>
<th>Week</th>
<th>Laboratory Investigation</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Orientation and project introduction</td>
</tr>
<tr>
<td>2</td>
<td>Group orientation and project planning</td>
</tr>
<tr>
<td>3</td>
<td>Basic lab skills, group’s Proposal Presentation</td>
</tr>
<tr>
<td>4</td>
<td>PCR Lab, group’s Draft 1 due, In-lab LA Interview</td>
</tr>
<tr>
<td>5</td>
<td>PCR Lab (continued) and 30 Days Lab</td>
</tr>
<tr>
<td>6</td>
<td>30 Days Lab (continued) and Genome Lab</td>
</tr>
<tr>
<td>7</td>
<td>Genome Lab (cont.), group’s Draft 2 due (5 copies), Prof/GA Interview</td>
</tr>
<tr>
<td>8</td>
<td>Independent Investigations, Ordering, Written Peer Review due</td>
</tr>
<tr>
<td>9</td>
<td>Independent Investigations [PBAs, Notebooks checks and troubleshooting]</td>
</tr>
<tr>
<td>10</td>
<td>Verbal Status Report Presentation due</td>
</tr>
<tr>
<td>11-12</td>
<td>Independent Investigations [PBAs, Notebooks checks]</td>
</tr>
<tr>
<td>13</td>
<td>In-lab Presentations (formal final talks about your findings)</td>
</tr>
<tr>
<td>14</td>
<td>Final research report (Draft 3) due</td>
</tr>
</tbody>
</table>
THE LABORATORY

LAB COURSE WORKLOAD
LB-145 is a 5-credit course that consists of two connected classes (lecture 3 credits, laboratory 2 credits) and because it IS two classes it requires twice as many hours of work as one class. LB-145L (lab class) is a 2-credit course. Since the laboratory is worth 2 credits, MSU requires that you work in-lab at least 4 hours each week. In addition to the in-lab time, for any 2-credit course, MSU expects you to spend 4-6 hours/week outside of class studying and working on assignments. There will be a certain amount of preparation that you and your research group will need to do before each lab and updating and journaling that you will need to complete in your scientific notebook. You will be expected to master only a handful of methods/techniques but do so deeply and develop sophisticated skill level to expand your mastery of research. Come to lab well-prepared and carefully listen to the instructions from learning assistants or experiments may take longer and writing papers may be more difficult than expected. To complete the labs, you will need the Laboratory Guide provided in the LB145 Course Pack. Review the lab guide materials required for each week during the semester, make plans, and re-read the appropriate section(s) in your lab guide or appropriate research literature before you go to lab. Get an idea what the lab will be about as well as what equipment you will need etc. Plan to printout and bring hardcopies to lab of any necessary materials, publications, etc., as a reference and for additional information, on what you will be studying. Before you leave the lab each time “check out” with a teaching assistant on duty. S/he may wish to review with you the material you studied, have reminders, or have some graded assignments to return to you.

ASSIGNMENT SCHEDULE

<table>
<thead>
<tr>
<th>Speaking (points)</th>
<th>Writing (points)</th>
<th>Discussing/Demonstrating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Presentation= 10</td>
<td>Group Draft 1 Paper= 30</td>
<td>LA interview= 10</td>
</tr>
<tr>
<td>Status Report Presentation= 10</td>
<td>Group Draft 2 Paper= 40</td>
<td>Prof/GA interview= 10</td>
</tr>
<tr>
<td>Formal Final Presentation= 20</td>
<td>Group Final Paper=100</td>
<td>Lab Notebook &amp; PBAs= 10</td>
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<tr>
<td>Peer Review worksheet= 10</td>
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</table>

<table>
<thead>
<tr>
<th>Week</th>
<th>Assignment(s) Due</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Proposal Presentation</td>
<td>10 pts</td>
</tr>
<tr>
<td>4</td>
<td>Draft 1 Paper, Interview in lab</td>
<td>30, 10</td>
</tr>
<tr>
<td>7</td>
<td>Draft 2 Paper (original &amp; 5 copies), Interview with Prof</td>
<td>40, 10</td>
</tr>
<tr>
<td>8</td>
<td>Peer Review worksheet</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Status Report Presentation</td>
<td>10</td>
</tr>
<tr>
<td>13</td>
<td>In-lab Formal Final Presentations</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>Paper Final Draft (2 copies)</td>
<td>100</td>
</tr>
<tr>
<td>(2-14)</td>
<td>Lab Notebook &amp; PBAs</td>
<td>10</td>
</tr>
</tbody>
</table>

Total 250 pts
The "Honors Option" for LB145 (optional)

*Note: The Honors Option for LB145 this semester is presenting your group’s research findings as an oral presentation, a talk not a poster, at the UURAF during the Spring Semester. This is an individual assignment (you give the talk solo) if you seek individual credit for your Honors Option. Be aware the MSU UURAF application deadline(s).

FYI: All students who find themselves interested in research as a potential career path can take advantage of the REU programs (nsf.gov/crssprgm/reu/) mentioned in class and listed online, as well as these opportunities (below).

Check out this info and ask Drs. Luckie and TA/LAs for more information on these topics if they are of interest to you.

1. UNDERGRADUATE RESEARCH WORKSHOPS
   Workshops with topics that usually include strategies for pursuing research opportunities on campus, preparing oral and poster presentations, abstract writing, and graduate school. Visit urca.msu.edu/event for an up to date listing

2. RESEARCH SEMINARS
   Every week a variety of research seminars occur on campus on cutting edge topics (viruses, stem cells, climate change, gene mapping, diseases caused by mutant genes etc).

3. UNIVERSITY UNDERGRADUATE RESEARCH AND ARTS FORUM (UURAF)
   UURAF provides MSU undergraduates with an opportunity to showcase their scholarship and creative activity. UURAF brings together an intellectual community of highly motivated students to share their work with faculty, peers, and external audiences. Registration opens in January and closes mid-February. For more information, visit http://urca.msu.edu/uuraf.

4. LYMAN BRIGGS RESEARCH SYMPOSIUM
   Every Spring Semester Lyman Briggs College holds a research forum of it's own.

5. FUNDING FOR STUDENT CONFERENCE TRAVEL
   The MSU undergraduate research office can provide additional funding to support students who are presenting research at a conference or meeting. Visit urca.msu.edu/faculty/funding for details on how to apply for this money. Funds are also available from Lyman Briggs.
A syllabus is a form of contract between the instructor and the students. If you, the student, complete tasks with a specific score a predefined grade is awarded. Read the announcements below and the syllabus in full before signing and submitting this page.

1. **WORKLOAD** As the Undersigned student, I am aware the laboratory in this course is worth 2 credits and will require me to attend lab on average 4 hours each week. Some weeks will require less, and some weeks will require more effort. If I prepare poorly for lab, it will take longer.

2. **TOURISM** I am aware that I will work with a group of students that sit together in lecture, work together as a research team in lab, write manuscripts and study together outside of class at night and on weekends. This course is designed for full-time residential LBC students and if I need to travel off-campus frequently (go home every weekend, etc), I should realize my group members may become unhappy, and I should discuss this with them or the prof.

3. **QUIZZES** As the Undersigned student, I am aware that I will have a quiz or graded exercise each week and unless I read the assigned pages in the reading, take notes and study them prior to the quiz, it’s likely I will get a low score on said quiz or exercise.

4. **EXAMS** As the Undersigned student, I am aware midterm exams may be purely essay style and provided in advance, and in this case I should work with my group studying the questions and developing excellent answers in the time prior to the test. If I just “cram” my studies and work into 48 hours prior to the exam, it’s likely I will get a low score on said midterm.

5. **VERBAL FINAL** I am aware that the final exam is long, and comprehensive, but an optional “verbal final” is also available. The verbal final is an individual interview with the instructor where I demonstrate my mastery by explaining the biology discussed in the course. The verbal final is pass/fail where passing results in a 100% score for the final exam.

6. **GROUP GRADES** I am aware that I, with the help of other students in my research group, will be authoring one research paper in lab (with a number of drafts) and my grade will include both the score of my section of the manuscript as well as the score for the manuscript as a whole. I realize I will be expected to review the entire manuscript before submission. If this doesn’t work well for me, I should discuss it with my group or the prof immediately.

7. **HONOR CODE** In the authoring of manuscripts, I accept that each draft must be submitted to http://turnitin.com for screening and thus I can and should screen my group’s draft prior submitting it to the instructor. I am also aware that if the sections authored by me are found to be plagiarized, I will be given a zero for the LB145 course grade.

I have carefully read the above announcements and the syllabus/owner’s manual. I understand the expectations are high but I’m ready. I agree to the tenets of the syllabus and this contract.

________________________________________  __________________________  __________________
Printed Name                       Signature                          Date
Owner's Manual
(with lots of ideas and text stolen from great authors, Drs. Alice Dreger and Tanya Noel)

Why is this an "owner's manual" instead of a syllabus?

Most syllabi contain only class schedule information. By contrast, this is more like an "owner's manual" like the sort that comes with a new car. If you read and use this manual, you will understand how this course works, and you will be able to keep the course running smoothly, and do the regular maintenance required to avoid breakdowns. Of course, this course isn't a car. It's more like a bus tour. I believe that a university course is in its essence not a number, and not a topic, but a group of people who share a common goal of learning about some particular thing. In this sense, a course is like a bus tour, a tour to a place which is unfamiliar to most of us. As the teacher, I am the bus driver and chief tour guide. Each member of the course starts off at “home” intellectually and emotionally and comes to the bus station which is the classroom. We agree to “take the tour” together, to get on the bus and travel together for the length of the course even though many of us may never have met before. Together we visit a number of different "places."

So why is this "owner's manual" so long?

I've discovered that the more information I give students, the more comfortable and in control they feel, and the better they learn. This packet contains lots of information. Besides telling you about the mechanics of the course, this packet tells you a lot about my teaching style. I used to provide my students with a separate "statement of teaching philosophy." It now occurs to me it is weird to separate that teaching philosophy from my teaching materials. So now my philosophy is embedded throughout this packet. My teaching style, methods, and philosophy change over time, thanks to students who tell me what works and what doesn't work. I'm counting on you to give me lots of feedback about what is working for you and what is not, and most importantly why. It is very important to me to do a good job for you. In addition to the LB145 course learning objectives provided earlier, be aware this course aligns with the following MSU Undergraduate Learning Goals:

Analytical Thinking
A successful student uses ways of knowing from mathematics, natural sciences, social sciences, humanities, and arts to access information and critically analyzes complex material in order to evaluate evidence, construct reasoned arguments, and communicate inferences and conclusions.

• Acquires, analyzes, and evaluates information from multiple sources.
• Synthesizes and applies the information within and across disciplines.
• Identifies and applies, as appropriate, quantitative methods for defining and responding to problems.
• Identifies the credibility, use and misuse of scientific, humanistic and artistic methods.

Effective Communication
A successful student uses a variety of media to communicate effectively with diverse audiences.

• Identifies how contexts affect communication strategies and practices.
• Engages in effective communication practices in a variety of situations and with a variety of media.

Integrated Reasoning
A successful student integrates discipline-based knowledge to make informed decisions that reflect humane social, ethical, and aesthetic values.

• Critically applies liberal arts knowledge in disciplinary contexts and disciplinary knowledge in liberal arts contexts.
• Uses a variety of inquiry strategies incorporating multiple views to make value judgments, solve problems, answer questions, and generate new understandings.
How does this course work in terms of the day-to-day?

We will meet two times a week for the lecture class and our meetings will consist of discussions of the readings and activities related to the topics we are investigating. Do the readings assigned for the day before you come to class and spend enough time thinking about the readings before class. You should come to class ready to summarize the readings and to ask and answer questions about them. Homework and quizzes will often be given on the readings.

Always give yourself plenty of time to do your work, and feel free to contact me whenever you need help or clarification. I like teaching and not only do I feel good when you learn, often when you learn something new, I learn, too.

Generally we will stick very closely to the attached schedule, however, the point of this class is for you to learn, so if we need to change our scheduled plans to achieve that goal, we will do so. If you feel that you need things to be done somewhat differently in class in order for you to learn better, please let me know and I will work to adjust our schedule or classroom dynamics so that we can maximize learning.

So what’s my feeling about teaching?

I love it! And I think it shows – my students have voted me “honorary member of the graduating class of Lyman Briggs” (“teacher of the year”) about five times in the last fifteen years, I was given the Teacher-Scholar Award of MSU, and most recently the 2015 MSU Alumni Club of Mid-Michigan Quality in Undergraduate Teaching Award (nominated by MSU faculty and alumni for teaching) and the 2017 Outstanding Faculty Award by the ASMSU Senior Class Council (nominated by MSU graduating seniors for teaching). If you hear that I am tough, I am, but that’s because I care about your learning. If I didn’t care about your learning, I would have stayed at Stanford University.

I am delighted to have recruited amazing LAs to help you do well in the course. You will find that our LAs share my love of teaching, of biology and dedication to helping you learn. But they are tough too because they want you to learn, lots. They are trained to answer your questions with responses in the form of guiding questions. Why? because it helps you learn and remember, and they know your next class (and career) will be far more difficult and demanding than this course, you know this too.

What else besides being in class will be required of you?

Note that this course uses a wider range of assignments than just several exams. This spreads out risk and stress so it’s lower level day to day and allows you to assess your own learning with lower-stake quizzes etc and avoid any surprises when facing the bigger exams. All points are weighted equally and in that sense, grades are pretty simple – and you can always check your total on the online D2L gradebook – but be sure to keep your own spreadsheet and alert me if my grade data has an error.

• **Quizzes on readings:** I will frequently give short quizzes on a day’s assigned reading at the beginning of the class meeting. These quizzes accomplish two things: (1) reward you for keeping up-to-date on the readings; (2) reward you for spending enough time on the readings to really understand them. If you read carefully, you should have little problem with the quizzes. If you have a lot of trouble with short, fast quizzes, remember there are lots of bonus options in this class you can use as substitutions. If you miss a
quiz because you are late or absent, you will receive a "0". These cannot be made up.

- **In-class "carbonless" papers:** A number of times this semester I will ask you in class to write a relatively short essay response to a specific question related to the course. These assignments are designed to help you reflect on the course material and to provide me with some feedback on your thinking process. If you are absent, you will receive a "0" on the "carbonless" paper. These cannot be made up.

- **Final exam:** You may take a Verbal Final exam or just the regular written one. Learn about the Verbal Final at the front of the Course Pack where it is provided as well as at the back of the Course Pack where a research paper on it is provided.

**A note on grades & FERPA:**

To support blind-grading we will often request that you not list your actual name but just provide your PID. Privacy, as required by MSU FERPA regulation, will be maintained by utilizing a code that is NOT your real A-PID, so we'll call it your B-PID. Your B-PID will be listed on D2L in your personal gradebook.

Backstory: In recent years university's have become very afraid of getting in trouble for breaking the law called FERPA (Family Educational Rights and Privacy Act). The law was created back in 1974 to protect the privacy of students and their grades. In response to it all universities created student ID numbers so instead of placing a grade next to a person's name, instructors could place it next to a student number to maintain privacy. Many universities chose to use a student's social security number to also be their student number. When identity theft became a big problem, universities then changed all their student ID numbers from social security to become some number randomly generated in house. In recent years now the student ID number itself has become protected. In fact, while other people are permitted to know your name, and even say it aloud and post it publically, the student ID number is super protected. Thus instead of using your officially MSU-issued A-PID, in this course MSU requires that we issue a new temporary student ID. We will call these the B-PID, since they are for "who you be".

Professors can use grades in two ways: they can use grades to "sort" students into "A" students, "B" students, etc.; or they can use grades as learning incentives and rewards. Unfortunately the sorting system generally sorts according to "talents" students either have or don't have before they ever reach a particular classroom, e.g., the talent of being able to memorize and recall a lot of things. I would rather use grades to encourage students to develop their skills, to expand their minds and interests. While students are often only familiar with positive curving (sometime called a mother's curve) a number of university classes use an actual curve that raises or lowers the grading scale with the goals to only permits a few students (like just 10 in a class of 100) to earn a 4.0 and then only a few (perhaps 20) are permitted to have a 3.5 etc. Even if everyone in the class got above a 90% on an exam the grade scale would shift up until only the prescribed number of students got a 4.0 grade. This is a real "curve" and, I will never grade on a curve like this. Our grading scale with stay exactly as stated in the syllabus and each student will get whatever grade she or he has earned
by the end of the semester. Nothing would make me happier than if everyone worked hard and learned a lot and got 4.0’s. I would feel that we had achieved something great if everyone got a 4.0.

Table 1- University-level grading system: The table below describes the relationships between grades, percent, and performance in the University-level grading system used in the LB-145 and LB-145L courses. The first column describes the letter/number grade. The second column describes the percentage associated with that grade. The third column describes the performance-level required to earn that grade.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (4.0)</td>
<td>90 to 100%</td>
<td>Outstanding Work- A “4.0” is Outstanding. It literally stands out. It has the characteristics described for 3.0 and 3.5-level elements but in addition, the work by itself impressed with how much &amp; well it was done. The student taught Prof something original.</td>
</tr>
<tr>
<td>B+ (3.5)</td>
<td>85 to 89.9%</td>
<td>Most Excellent Work - A “3.5” is Most Excellent. Every detail of the work was done extremely well and they found additional papers and evidence beyond what they were told.</td>
</tr>
<tr>
<td>B (3.0)</td>
<td>80 to 84.9%</td>
<td>Excellent Work - A “3.0” score is considered Excellent. It is impressive work, top of the class, and the work was done extremely well but nothing beyond what was expected.</td>
</tr>
<tr>
<td>C+ (2.5)</td>
<td>75 to 79.9%</td>
<td>Pretty Good Work- A “2.5” is Pretty Good, the student did the minimum work required and did a pretty good job, this is expected at the university level and average for the class.</td>
</tr>
<tr>
<td>C (2.0)</td>
<td>70 to 74.9%</td>
<td>Average Work - A “2.0” is average, the student did the minimum work required.</td>
</tr>
<tr>
<td>D+ (1.5)</td>
<td>65 to 69.9%</td>
<td>Below Average Work - the student did less than minimum work required.</td>
</tr>
<tr>
<td>D (1.0)</td>
<td>60 to 64.9%</td>
<td>Poor Work- the student did less than minimum work required and of poor quality.</td>
</tr>
<tr>
<td>F (0.0)</td>
<td>0 to 59.9%</td>
<td>Failing Work- the student did far less than minimum work required and very poor quality.</td>
</tr>
</tbody>
</table>

Remember, if at any point you feel confused or distressed about your grades, carefully review the syllabus and then please come and talk to me.

Course Structure
This course will use a public website and online tools like Turnitin, CATME, Desire2Learn, and Top Hat. The course website may include online lessons, course materials, and additional resources. Activities may consist of readings, discussion forums, email, journaling, wikis, and other online activities. You will need your MSU NetID to login to the course to access the grades on D2L (http://d2l.msu.edu).

Technical Assistance
If you need technical assistance at any time during the course you can:

- Visit the Desire2Learn Help Site (http://help.d2l.msu.edu/)
- Visit the TopHat Support Site (https://success.tophat.com/s/)
Resource Persons with Disabilities (RCPD)

- To make an appointment with a specialist, contact: (517) 353-9642
  Or TTY: (517) 355-1293
- Web site for RCPD: http://MYProfile.rcpd.msu.edu

Definitions, terms, transparency

Admission: I believe caffeine and sugar increase attention and learning but have no empirical data to support this, except for donuts, that is documented but just for 15 minutes post eating. I like the drink called the Cortado (it’s coffee, like a tiny latte) but particularly enjoy the moment I pour cane sugar out of the brown paper packet on top of the frothed milk and watch it sink into the drink. When you come to office hours, unless there’s a rush, I’ll likely offer you an espresso. Just sayin’.

Attendance: Student learning is impacted by many things, yet education research has robustly shown it is significantly impacted by these three things: class size, teacher quality and attendance. You are, of course, permitted to skip any class meeting you wish but often a single clicker point is made available to you, to encourage attendance since it correlates with learning. Attendance at the meeting of a class will be defined as being physically present in the room for the full time period of the class meeting. Thus be present, in your seat with you notebook open and pen in hand, at the very beginning when the clock in room strikes the hour and class begins, still there during/throughout the entire duration of the class, as well as at the very end of the official time period (feel free to come and go to visit the restroom, just not off vacationing elsewhere). It’s only fair to treat students who arrive late exactly the same as those who depart early. We will often reward students for attendance by using technology to record your presence. If you fail at using your device to click-in for attendance at the beginning middle or end of class, due to whatever reason, be aware we do not micromanage the attendance data (no appeals). Making the choice to schedule another course that has a start or finish time that is proximal or even overlaps with this class is, of course, your choice and entirely acceptable. Yet this will not change the definition of attendance or waive it. University students are adults and literally everything in a course is optional, yet if you want points, in this case for attendance (and more importantly to learn) you have to be there.

Opera: Do you like the Opera? I am sucker for a good Italian opera with tenors belting out classic arias or whatever. Yet, related to attendance, while strolling into class 3, 5, 7, 15 minutes late may feel like a choice, e.g. “I’m an adult”, sure, but distracting the learning of other students in the room, who paid thousands of dollars for the class, is a problem and it does impact their learning. Part of my job is to protect student learning from distraction. If ten students turn up late to a class each day it meets and they arrive at different moments, e.g. 3, 5, 7, 15 minutes late, the students in the room are distracted regularly and significantly. Consider how distracting that is when people come in and you’re trying to watch a movie at the cinema. Thus please avoid trickling in and instead gather with other late arrivers and usher yourselves in all at one moment whenever possible.

Participation: It turns out participation is different than attendance. It refers to a student who is actively working to learn the materials discussed in the course. Students who are
active participants do not merely talk during class but also prepare in advance for class. This means carefully completing the readings, taking notes on them (best for learning, do this by hand written notes on paper) and preparing for the upcoming class meeting by reviewing notes and highlighting any questions you thought of while preparing for class. To reward this behavior, which enhances learning, often there will be a pop quiz or problem or writing exercise during class which is scored. Also there are clicker questions during lecture and you earn a point each time you chose a correct answer. You only need to get half of all clicker points to earn a perfect 100% score for participation. And, if you go above that level, all those extra clicker points become extra credit for you and help fill in for points you lost on any other assignment in the course. If you prepare for class you’ll get lots of points and if you don’t you get less. This helps increase the number of people that ultimately decide they need to study the material prior to class and as a result also learn more when discussing the material again in class. If you prepare, class is fun and interesting. If you don’t it becomes confusing and frustrating, as it feels like everyone else seems to know all the answers while you don’t even understand the questions.

Viewing Star Wars & The Matrix on your laptop during class: I was a youngsters in 1977 when the first Star Wars film came out and really enjoyed it. Also really thought The Matrix was fantastic back when it came out. Yet, even though I love those films, I am aware it is incredibly distracting to other students when someone near them in class has open their laptop’s massive vivid screen displaying films or email or Instagram or Twitter or working on the paper due next class, or more likely all of the above simultaneously. Thus while you can temporarily open a laptop to use it as a clicker or check the textbook for a few minutes, if your want to just leave it open for long periods sit in a seat where no students can be behind you. Similar to sitting in class and opening a big paper newspaper, how often have you been in a class when that happens?, opening a big screen that is like a vivid active billboard is not permitted if it distracts others. On the other hand, small tablets that lay flay in front of you, like a notebook, may be used wherever and wherever you like, since they are not as “in your face” as a near vertical screen can be. But don’t prop up your tablet like a laptop. You are allowed to distract yourself but not others (see additional info in Tips from Tanya below).

Random calling in lecture: How often have you been in a big lecture class that has about 8 students sitting down near the front, who are the only people who ever are called upon to answer the professor’s questions in lecture? The other 100+ students throughout the entire semester will generally never speak aloud during lecture. After awhile you get used to it. Everyone knows that “those students” answer questions, so we don’t have to, cool. Yet, deep down you know, while it’s comfortable to never have to answer a question, it likely reduces your learning, heck some folks fall asleep. My wife tells a story about a small class where the Prof always asked these incredibly difficult questions that nobody ever even understood. Then one day, near the end of the semester, she did the reading prior to class and during class realized that ever single question the Prof asked was directly out of the reading. She was embarrassed because she realized the Prof must know nobody does the reading, given no student ever even understood the questions he asked even though they were right out of the first pages of each reading. Because our goal in this class is learning we will use random calling in lecture to help everyone increase their learning and gain skills at communication/public speaking.

Blind grading: When a computer scores a scantron bubble sheet from a multiple choice exam, it is objective, it doesn’t have a pre-conception as to which students are smart, or
are nice to it, etc, so it treats everyone the same and just rewards correct answers. Unfortunately, human graders are less objective. LAs, GTAs, and Profs, are all unable to be perfectly objective when they have already had interactions with the person whose work they are grading. While they try hard to be so, education research shows that even knowing what the person's name is will impact the grader and grade (even if they never met the person). Thus imagine if they know the person reasonably well. If they have read prior papers, knew the person's prior grades, or had a number of positive (or negative) conversations with a student. Wow, that will cause major problems when trying to be objective while grading even for the best teacher ever. Unless the grader is blind to the identity of the author. Professional journals and grant review panels use single blind or double blind systems to avoid subjective evaluation. We will use this in our class too.

---"Tips from Tanya": Some points for students about technology in the classroom

**Author:** Dr. Tanya Noel

Almost everyone has a smartphone, laptop, tablet, or combination of these devices with them during their waking hours (and beyond, in some cases). There is huge potential for distraction using these devices – which is fine if you’re waiting in a long, boring line or on the bus, but can be problematic in the classroom. Be aware of:

- **There have been studies that have shown “multi-tasking” in class is detrimental to learning.** (Actually, the evidence overwhelmingly suggests humans can’t really multi-task … or, at least, can’t multi-task well!) If you’re trying to go back and forth between course-related stuff and other websites (or assignments for other courses, etc.), this will affect how well you’re learning/working.

- **Notifications (e.g., beeps/vibrations for new emails, text messages, etc.) are highly distracting, and feed into “reward systems” in the brain that can reinforce behaviors like frequently checking your phone, Facebook, etc.** (You know that uncomfortable feeling that makes you check your phone/email? Your brain gets a dopamine hit when you give into that urge … and makes it more likely to continue the behavior leading to the reward.) **Consider turning off these notifications**, at least during class and other times when you want to be able to focus uninterrupted. (Some people have found turning off notifications altogether has helped them not only focus, but reduced their stress levels!)

- **Online videos are highly distracting in class to students nearby.** (They’re obviously distracting to the person with the device, but they chose to be distracted!) If you really have to watch video in class, please make sure the sound is off (or you’re wearing headphones), and sit somewhere out of sight of others (e.g., back corner of room).

- **Note-taking on computers (vs. by hand) is associated with lower-quality learning/test scores.** Results from some recent studies (admittedly under some very specific conditions) have supported the idea that writing notes by hand on paper is superior to taking notes on the computer. There are a number of hypotheses about this, but many experts agree that taking notes by hand involves more thinking about what’s important and worth writing down (as you can’t transcribe every word spoken by the professor). On the computer, it is tempting to try to record everything verbatim, with the brain not processing much of the information. Interestingly, one study found that an activity akin to live-
tweeting course content was associated with learning – perhaps the effort required to distill information into 140 character tweets is similar to the type of cognition involved in making good hand-written notes! If you take notes by computer, develop the habit of summarizing important points, and/or noting things you want to look up outside of class (and why). It’s probably helpful to review your notes regularly, summarizing and integrating material.

References:


Chapter Checklists for each lecture

I strongly suggest attaching a sheet for the current week to your “work wall” where you can see it at a glance and literally check off items as you complete them.

Before first day of class:

**Obtain supplies for course:** online textbook, course pack, carbonless-paper notebook, lecture notebook and TopHat online homework system. *See course website for more details ([msu.edu/course/lb/145/](http://msu.edu/course/lb/145/)).

1. ________ **Buy** ($25) the LB145 Lecture & Lab Course Packet (for students in Luckie's sections) at the Collegeville Textbook Store at 321 E. Grand River Ave in East Lansing ([ctcmsu.com](http://ctcmsu.com), 517-922-0013). This Course Pack contains the syllabus, lecture handouts, learning objectives, lab manual, lab notebook, scientific papers and more. A pdf of the Course Packet is also available on the course website for easy 24/7 access.

2. ________ **Buy** ($35) our online Integrating Concepts in Biology (ICB) textbook. Do not buy an expensive $259 Biology textbook! Please just buy this $35 online textbook. **Note:** this textbook is custom-assembled just for this class, so be sure to buy Luckie's version of the ICB textbook ([trinity.org/textbooks/52632](http://trinity.org/textbooks/52632)).

3. ________ **Buy** ($7) a Carbonless-Paper Notebook for in-class writing exercises (you write, it also makes a copy, you can turn in one copy and keep the other): Buy this cheap online ([Amazon $6.99](https://www.amazon.com)), or you can always find one at the SBS bookstore at 421 E. Grand River Ave in East Lansing, in the "Lab Notebook" section ([sbsmsu.com](http://sbsmsu.com), (517) 351-4210).

4. ________ **Buy** ($20) access to TopHat online homework & clicker system. Do not spend $100+ for an online homework system like Mastering Chemistry/Biology and then also buy a $50 clicker you might break or lose. Please just buy the $20 TopHat online homework system for the semester, which also permits you to use your phone/tablet/laptop as a clicker. Click the TopHat.com link on course website.

5. ________ **Buy** ($5) a traditional paper Lecture Notebook. Can be spiral bound or 3-ring bound as long as there is real paper that you'll write on lots (mostly for taking notes when doing the readings prior to lecture). Be sure to **write all notes by hand** because it greatly increases your learning.¹

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Week 1

(Preparing for the first day of class) **Tuesday's lecture:**

**Budgeting homework time (45 min):** Read the 1995 *Review paper* on Cystic Fibrosis by Welsh and Smith on pages 267-274 of your Course Pack. Take a few handwritten notes in your notebook that focus on defining the normal functions of the CFTR protein and what happens to it that leads to the disease.

(Preparing for the second day of class) **Thursday's lecture:**

**Budgeting homework time (70 min):** Ch. 1, section 1.2 is approximately 2600 words in length. At what's considered slow reading speed, 200 words per minute, reading section 1.2 should take 13 minutes. But when done properly, when you pause to review figures, read and think about a few of the Integrating Questions, and take careful notes, if you focus (avoid distraction) it should take you approx. 70 minutes.

1. ________ For the first lecture, read the 1-page *Foreword* written by the very famous Dr. Bruce Alberts, review the Student Resources in Chapter 0, and then begin reading Chapter 1: *Heritable Material* of our textbook, Integrating Concepts in Biology (ICB). Read the single Introduction page, and the short section 1.1 of Chapter 1, but you do not need to take notes on any of those pages.

2. ________ Then slowly read the section we will discuss most during lecture, section 1.2 "What is the heritable material?" As you read section 1.2 on your computer or tablet be sure to **take handwritten notes in your lecture notebook** (handwritten notes lead to much greater learning).".

3. ________ **Try to answer at least one Integrating Question (IQ) in each set.** As you read the ICB textbook always attempt to answer at least one of the yellow Integrating Questions each time you get to a set of them. It will help you test yourself to determine if you got the meaning, or not, while reading the last few paragraphs. Just like taking handwritten notes, this too will greatly increase your learning. If you desire a high grade in the course, try to answer more IQs.

   **NOTE:** Assume you will be asked a question in lecture which is directly from one of the IQs.

4. ________ **Trifecta: Prepare to explain (aloud) Figures 1.2, 1.3 and Table 1.1 in class.** As you read a section from the ICB textbook always attempt to pause and study each figure/drawing/table that is discussed. Some of them are just pictures or drawings and may not require lots of thinking, but others are graphs or tables that contain actual data from research experiments. Spend more time looking at these. In class, during lecture, students will be randomly chosen to explain a Figure or Table aloud (LA will hand you a microphone) so prepare for when your name is called to be sure you are ready. *Some students avoid stress by just writing out in their notebook an explanation of the Purpose, Methods and Findings of each data figure* (we call these three things the Trifecta). If it’s already written down then you can just read aloud what you wrote, like: "Purpose: Dr. Griffith wanted to determine...., Methods: his group worked with mice and pneumonia bacteria called...., Findings: in the end they found evidence that ...".

5. ________ **Advanced Tip reported from prior student:** "The way the textbook explained this figure did not make sense to me, so I scrolled down to the bottom of the page and clicked on link to the original paper and read about the same figure in that. The way the paper explained it made so much more sense and cleared up what I was confused about. Tell other students about this!"

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Week 2

(Preparing for) Tuesday's lecture:

Budgeting homework time (45 min): Ch. 4, section 4.1 is about 1250 words in length and ELSI 4.1 is 1100 words thus the total is 2350 words. At 200 words per minute, reading section 1.2 & ELSI should take 12 minutes, but when done properly, when you pause to review figures, read and think about a few of the Integrating & Review Questions, and take careful notes, this homework assignment should take you more like 45 minutes (and longer if you are distracted by texts, friends, email etc.).

1. ______ For the second lecture, read the introduction page of Chapter 4: Evolution and Origin of Cells in the ICB textbook, but you do not need to take notes on that page. Then slowly read section 4.1 "What is Evolution?" and as you read it on your computer be sure to take handwritten notes*. Last, read the section Ethical, Legal, Social Implications (ELSI) 4.1: "Are evolution and religion compatible?" You do not need to take notes on the ELSI reading, just think about it.

2. ______ Try to answer some Integrating Question and Review Questions. As you read the ICB textbook always attempt to answer at least one of the yellow Integrating Questions each time you get to a set of them. Also answer the green Review questions.

3. ______ (Trifecta): Prepare to explain (aloud) Figures 4.1, 4.2 and ELSI Figure 4.1 in class. As you read a section from the ICB textbook always attempt to pause and study each figure/drawing/table that is discussed. In class, during lecture, you may be randomly chosen to explain these aloud (the LA will hand you a microphone so everyone can hear you in lecture) so prepare well.

4. ______ Advanced Tip: scroll down to the bottom of the page and click on the link to an original version of Darwin's Origin of Species, peek at it, and look at some of the other research papers in the Bibliography to get used to, and in a habit of, doing this.

(Preparing for) Thursday's lecture:

Budgeting homework time (70 min): In Ch. 4, the first 2/3's of section 4.2 is 3000 words in length which should take 15 minutes if you just read it. But when done properly, when you pause to review figures, read and think about a few of the Integrating Questions, and take careful notes, this homework assignment should take you more like 70 minutes (and that's if you are not distracted).

1. ______ For the third lecture of the semester, read Chapter 4’s section 4.2 "Could abiotic molecules form biologically important molecules before life evolved?" and as you read it on your computer be sure to take handwritten notes*. You should focus mostly, and only take detailed notes for the first 2/3s of the section. You can stop taking notes once you complete the yellow Integrating Questions 5 & 6. Read the remaining section regarding RNA and directed evolution, but no notes needed on this, just be amazed at what is said.

2. ______ Try to answer some Integrating Question and Review Questions. As you read the ICB textbook always attempt to answer at least one of the yellow Integrating Questions each time you get to a set of them. Also try to answer the green Review questions.

3. ______ (Trifecta): Prepare to explain (aloud) Figures 4.5, 4.6, and 4.8 in class (Purpose, Methods, Findings)

4. ______ Advanced: Click on "Explore More on Abiotic Production of Organic Molecules" to learn a little about research published in 2016. Just take a peek, read the abstract.
Week 3

(Preparing for) Tuesday's lecture:

Budgeting homework time (70 min): In Ch. 4, the first half of section 4.3 is 2000 words in length and section 4.4 is 1500 words, totaling 3500. This should take 17 minutes if you just read it. But when done properly, when you pause to review quite a few figures, read and think about a few of the Integrating Questions, and take careful notes, this homework assignment should take you more like 70 minutes (if you are focused). Special Allowance: Your group can divide up the Trifectas for this lecture.

1. _______ For Tuesday's lecture, read Chapter 4's section 4.3 (1st half) in the ICB textbook, and then section 4.4. For section 4.3 "Can non-living objects compete and grow?" you only need to carefully read and take notes on items up to and including information related to Figure 4.13. Then stop taking notes and just read the rest to learn about research on vesicles competing with each other. Explore Bio-Math Exploration 4.2 if you find it interesting. Then read and take notes on all of the short reading in section 4.4 "Can non-living objects harvest and store energy?". Be sure to take handwritten notes.

2. _______ Try to answer some Integrating Question and Review Questions. As you read the ICB textbook always attempt to test yourself a little, answer at least one of each set.

3. _______ (Trifecta): Prepare to explain (aloud) Figures 4.11, 4.12, 4.13 and 4.17 in class.
   *Special Allowance today*: If you wish your group can designate who will be responsible for each figure and thus split up the responsibility and reduce the load (Purpose, Methods, Findings).

(Preparing for) Thursday's lecture:

Budgeting homework time (60 min): In the Chapter Photosynthesis (OSB) section 8.1 is 1624 words but has quite a few figures. This should take 8 minutes if you just read it. But when done properly, when you pause to review figures and take good notes, this assignment should take you more like 45 minutes. Give yourself at least 10 more minutes to google and read about Lynn Margulis and take a few notes.

1. _______ For Thursday's lecture, first google "Lynn Margulis" to find, read about, and take notes on, the endosymbiotic hypothesis. Then in the chapter Photosynthesis (OSB), read section 8.1 "Overview of Photosynthesis" and take handwritten notes.

2. _______ (Tip): Prepare to explain (aloud) the anatomy of a chloroplast, and Figure 6, in class.

3. _______ Advanced: Take a peek at section 8.2, in particular study Figure 7. Be ready to act out this process in class.
Week 4

(Preparing for) **Tuesday's lecture:**

**Budgeting homework time (60 min):** Photosynthesis (OSB) section 8.2 is 2603 words in length, but has quite a few figures. This should take 13 minutes if you just read it. But when done properly, when you pause to review figures and take careful notes, this assignment should take you more like 60 minutes.

1. _______ **For Tuesday's lecture,** in the chapter Photosynthesis (OSB) read section 8.2 "The Light-Dependent Reactions of Photosynthesis" and as you read it on your computer be sure to take handwritten notes in your lecture notebook.

2. _______ **(Tip):** While you are reading focus mostly and take notes regarding **Figures 5, 7, and 8.** We will discuss these in class.

3. _______ **Advanced:** Take a peek at section 8.3, in particular study Figure 1. Take a sneak peek at "Chapter 11: Photosynthesis", section 11.1, study Figures 11.2 and 11.3.

(Preparing for) **Thursday's lecture:**

**Budgeting homework time (60 min):** Photosynthesis (OSB) section 8.3 is 1573 words in length, and does not have many figures. This should take 13 minutes if you just read it. But the video is 12 minutes and when done properly, when you pause to review figures and take careful notes, this assignment should take you more like 60 minutes.

1. _______ **For Thursday's lecture,** read section 8.3 "Using Light Energy to Make Organic Molecules" (1573 words) in the chapter Photosynthesis (OSB) and take handwritten notes.

2. _______ **(flipped classroom):** Watch the **12min lecture by Mr. Andersen** provided where he gives quickly reviews Photosynthesis. Add to your notes any interesting points he makes that helped you better understand the parts of the cell and what they do.

3. _______ **(Tip):** While reading, focus mostly and take notes regarding **Figures 1, and 2.** We will discuss these in class.

4. _______ **Advanced:** Take a sneak peek at "Chapter 11: Photosynthesis", section 11.1, in particular study Figures 11.4.
Week 5

(Preparing for) Tuesday's lecture:

Budgeting homework time (70 min): Chapter 11 section 11.1 is long with many figures that require thinking and notetaking. The first 2/3's of it is the most important part and just reading that part, which is 3800 words, should take 21 minutes or longer. The data figures are important while those that are just drawings, like 11.3, 11.6, 11.7, 11.9, are not. Of course, when done properly, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 70 minutes. Special Allowance: Your group can divide up the Trifectas for this lecture.

1. _______ For Tuesday's lecture, read Chapter 11: Photosynthesis, section 11.1 "Why is paraquat used in America but illegal in Europe?" and as you read it on your computer be sure to take handwritten notes in your lecture notebook. Please read carefully and take good notes for the first 2/3s of the section (which is about 3800 words). You can stop taking notes when you come to the yellow box of Integrating Questions #11-14. Then just read the last 1/3 of the section for deeper thought and better understanding.

2. _______ Try to answer some [Integrating Questions] and [Review Questions]. As you read the ICB textbook always attempt to test yourself a little, answer at least one of each set.

3. _______ (Trifecta): Prepare to explain (aloud) Figures 11.1B, 11.2A, B, C, 11.4, 11.5, and 11.8A in class. *Special Allowance today*: If you wish your group can designate who will be responsible for each figure and thus split up the responsibility and reduce the load (Purpose, Methods, Findings).

4. _______ Advanced: Take a peek at section 8.3, in particular study Figure 1. Take a sneak peek at "Chapter 11: Photosynthesis", section 11.2.

(Preparing for) Thursday's lecture:

Budgeting homework time (70 min): Chapter 11 section 11.2 is 3593 words in length with several data figures that require thinking and notetaking for the Trifecta. Reading at 200 words per minute would mean the section might take 18 minutes to read. Of course, when done properly, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 70 minutes. It could be shorter if you have been doing homework regularly, ie. training like an athlete, and getting much better at this now that it is week 5.

1. _______ For Thursday's lecture, read Chapter 11: Photosynthesis, section 11.2 "How does Brazil’s rainforest affect Greenland’s glaciers?" (3593 words), and take handwritten notes in your lecture notebook.

2. _______ Try to answer some [Integrating Questions] and [Review Questions]. As you read the ICB textbook always attempt to test yourself a little, answer at least one of each set.

3. _______ (Trifecta): Prepare to explain (aloud) Figures 11.11 (just pick one graph), 11.12, 11.13, and 11.15 (Purpose, Methods, Findings).
Week 6

Tuesday lecture:

EXAM I

(Preparing for) Thursday's lecture:

Budgeting homework time (75 min): This is a professional Review Paper that is 4500 words in length from an important medical journal so it will take some time to read, but if you have gained some understanding about CF while working in the lab this semester you should be able to more quickly grasp most of what is discussed. If you struggle with the text, focus on each figure and determine what it is trying to explain. Scientists almost always first focus on the figures.

1. _______ For Thursday's lecture, read Steven Rowe et al's review paper "Mechanisms of Disease" on Cystic Fibrosis published in New England Journal of Medicine back in 2005. This paper is provided at the back (around page 275) of your Course Pack. You do not need to take notes from all, simply read for your own learning and to help you with your research.

2. _______ Write out in your lecture notebook your explanation for Figures 1, 3, and 5.

3. _______ (Tip): Prepare to explain (aloud) Figures 1, 3, and 5 in class. While reading, focus mostly on the figures. We will discuss these in class. Be prepared to state aloud what each figure is trying to explain or communicate. Prioritize Figures 1, 3, and 5 as most important to understand and be able to explain in class.
Week 7

(Preparing for) Tuesday's lecture:

Budgeting homework time (60 min): Chapter 5 section 5.1 is 2090 words in length with several data tables and figures that require thinking and notetaking for the Trifecta. Reading at 200 words per minute would mean the section might take 10 minutes to read. Of course, when done properly, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 60 minutes. It could be shorter if you have been doing homework regularly, i.e. training like an athlete, and getting stronger, better, faster at this now that it is week 7.

1. _______ For Tuesday's lecture, read Chapter 5: Evolution Applied, section 5.1: "How do genetic diseases arise?" and as you read it be sure to take handwritten notes.

2. _______ Try to answer some Integrating Questions and Review Questions. As you read the ICB textbook always attempt to test yourself a little, answer at least one of each set.

3. _______ (Trifecta): Prepare to explain (aloud) Figure 5.1, and Tables 5.1, 5.2 and 5.3 in class (Purpose, Methods, Findings).

4. _______ Advanced: Take a peek at several of the published research papers in the Bibliography at the bottom of the page. This may help you understand how to make taq polymerase function more efficiently in your own PCR research project.

(Preparing for) Thursday's lecture:

Budgeting homework time (60 min): The Chapter Cell Structure (OSB) section 4.3 is 3060 words in length with a number of art figures (no data figures for trifectas). Reading at 200 words per minute would mean the section might take 15 minutes to read. But the video is 14 minutes and when done properly, when you pause to review figures and take careful notes, this assignment should take you more like 60 minutes.

1. _______ For Thursday's lecture, read section 4.2 "Prokaryotic Cells" and 4.3 "Eukaryotic Cells" in chapter Cell Structure (OSB). For section 4.3 (3060 words) take handwritten notes in your notebook.

2. _______ Compare and contrast the anatomy of a Prokaryote versus Eukaryote. Then also a plant cells versus an animal cell. Which seems most advanced, why?

3. _______ (flipped classroom) Watch the 14min lecture by Mr. Andersen provided where he gives you a tour of the cell. Add to your notes any interesting points he makes that helped you better understand the parts of the cell and what they do.

4. _______ While reading, focus mostly and take notes regarding Figures 2 & 3, and 4 & 5, and note the building block of cell walls/wood in Figure 9. We will discuss these in class. Generally, you need to learn the names and functions of each organelle. It’s best to create hand-made flash cards with the name on one side and the function on the other. Also add interesting facts, like a drug user would be expected to have more of which organelle? Use these to study prior to class and then prior to the exam too.

5. _______ Advanced: Take a sneak peak at section 4.4, in particular study Figure 1.
Chapter Checklists

Week 8

(Preparing for) Tuesday's lecture:

Budgeting homework time (30 min): The Chapter Cell Structure (OSB) section 4.4 is 1430 words in length with a number of art figures (no data figures for trifectas). Reading at 200 words per minute would mean the section might take 7 minutes to read. When done properly, when you pause to review figures and take careful notes, this assignment should take you more like 30 minutes.

1. _______ For Tuesday's lecture, read section 4.4 "The Endomembrane System and Proteins" in chapter Cell Structure (OSB) (1430 words). Take handwritten notes in your lecture notebook.

2. _______ Compare and contrast the anatomy of a Prokaryote versus Eukaryote. What's similar, what's different. Then also compare a plant cells versus an animal cell. Which one is a eukaryote, why, which cell type do you think seems the most advanced, evolutionarily, why?

3. _______ While reading, focus most on Figure 1. We will discuss this process of biosynthesis in class. Generally, you need to learn the names and functions of each organelle in the endomembrane system. In particular what are the functions of that organelle in general as well as in particular during the biosynthesis of a protein. It's best to create hand-made flash cards with the name on one side and the function on the other. Also add interesting facts, like where does CFTR go and what happens to it during its expression from a gene and conversion into a functioning protein, where does it end up? What about insulin, what happens when it is made, does it do the exact same thing? Use these to study prior to class and then prior to exam too.

4. _______ Advanced: Take a sneak peek at section 8.2 for Thursday.

(Preparing for) Thursday's lecture:

Budgeting homework time (60 min): Chapter 8, section 8.2 (first half) is 2498 words in length with four data tables and figures that require thinking and notetaking for the Trifecta. Reading at 200 words per minute would mean the section might take 13 minutes to read. Of course, when done properly, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 60 minutes.

1. _______ For Thursday's lecture, read Chapter 8: Cell Structure and Function, section 8.2: "Why aren't there giant cells?" and as you read it be sure to take handwritten notes on the first half (2498 words). You can stop taking detailed notes when you begin reading the light blue box denoting the second section on "Calculated cell limitations". Just read that short section for deeper understanding.

2. _______ Try to answer some Integrating Questions and Review Questions. As you read the ICB textbook always attempt to test yourself a little, answer at least one of each set.

3. _______ (Trifecta): Prepare to explain (aloud) Figures 8.14, 8.15 and 8.16 in class (Purpose, Methods, Findings)

4. _______ Advanced: Take a peek at some of the published research papers in the Bibliography at the bottom of the page with the goal to find the original figure you studied here in the reading and where it is in the paper?
Chapter Checklists

Week 9

(Preparing for) Tuesday's lecture:

Budgeting homework time (70 min): Section 5.2 of Structure and Function of Plasma Membranes (OSB) is 3856 words in length with a number of art figures (yet no data figures for trifectas). Reading at 200 words per minute would mean the section might take 20 minutes to read. But the two videos are 6 & 8 minutes each, and when done properly, when you pause to review figures and take careful notes, this assignment should take you more like 70 minutes.

1. _____ For Tuesday's lecture, skim section 5.1 "Components and Structure" in the chapter Structure and Function of Plasma Membranes (OSB) then carefully and slowly read section 5.2 "Passive Transport" (3856 words) and for that one please take handwritten notes in your lecture notebook.

2. _____ (flipped classroom) Watch the 6-min lecture by Mr. Andersen on membrane structure. You do not need to take notes on this.

3. _____ Then review section 5.2 again, now focus and take notes regarding Figures 1, 2, 3 and 5. We will discuss these in class.

4. _____ (flipped classroom) Watch the 8-min lecture by Mr. Andersen provided where he gives you an explanation of the topics: diffusion and osmosis. Add to your notes any interesting points he makes that helped you better understand what they are all about.

5. _____ Advanced: Take a sneak peek at the next section 5.3, in particular Figure 1.

(Preparing for) Thursday's lecture:

Budgeting homework time (30 min): Section 5.3 of Structure and Function of Plasma Membranes (OSB) is 1532 words in length with four art figures (no data figures for trifectas). Reading at 200 words per minute would mean the section might take 8 minutes to read. If done properly, when you pause to review figures and take careful notes, this assignment should take you more like 30 minutes.

1. _____ For Thursday's lecture, read section 5.3 "Active Transport" in the chapter Structure and Function of Plasma Membranes (OSB) (1532 words) and take handwritten notes in your notebook.

2. _____ While reading, be sure you can explain Figures 1 and 3. We will discuss these in class.

3. _____ Advanced: What is one way to determine whether ion movement is due to passive transport or active transport? Does this hold true for CFTR?
Week 10

(Preparing for) Tuesday's lecture:

Budgeting homework time (60 min): Read "Systems of Gas Exchange" in the chapter The Respiratory System (OSB) with several art figures (no data figures for trifectas). Yet you can focus on the important part, the second half, on "Mammalian Systems" which is only 1400 words. Reading at 200 words per minute would mean the whole section might take 13 minutes to read. If done properly, when you pause to review figures and take careful notes just in the "Mammalian Systems" section, this assignment should take you no more than 30 minutes of reading time. Then watch the 20-minute Khan Academy video to really get a good understanding of pulmonary anatomy & function, and take a few notes. Total estimated time is for homework is 60 minutes.

1. _______ For Tuesday's lecture, read section 39.1: Systems of Gas Exchange, in the chapter The Respiratory System (OSB) (2350 words). Take handwritten notes in your lecture notebook on the second half of the reading, starting at the section "Mammalian Systems".

2. _______ (flipped classroom) Watch the really helpful 20-min lecture from the Khan Academy provided where he gives you an explanation of the topics of ventilation and respiration. Add to your notes any interesting points he makes that helped you better understand what they are all about.

3. _______ Advanced: Take a sneak peek at the images and movies in this chapter's section on "Breathing" on the mechanics of breathing particularly related to humans.

Thursday lecture:

EXAM II
Week 11

(Preparing for) Tuesday's lecture:

Budgeting homework time (60 min): This is a professional Review paper that is 3700 words in length from an important medical journal so it will take some time to read, but if you have gained some understanding about genetics and diseases while working in the lab this semester you should be able to more quickly grasp most of what is discussed. If you struggle with the text, focus on each figure and determine what it is trying to explain. Scientists almost always first focus on the figures.

1. ______ For Tuesday's lecture, read Kenneth Polonsky's review paper on "The Past 200 Years in Diabetes" published in New England Journal of Medicine in 2012. This paper is provided at the back of your Course Pack. You do not need to take notes from all the written text, simply read for your own learning and to help you with your research.

2. ______ While reading, focus mostly on the figures. We will discuss these in class. Be prepared to state aloud what each figure is trying to explain or communicate.

3. ______ Write out in your notebook your explanation for Figure 2 and how that structure relates to what you learned about the biosynthesis of a protein back in the reading and lecture about Endomembranes. Describe how you predict the insulin protein is made DNA -> RNA -> protein and the path it takes via which organelles and what happens to it at each?

(Preparing for) Thursday's lecture:

Budgeting homework time (70 min): Chapter 23, section 23.1 is 3891 words in length with 10 figures and three of which are data tables/figures that will require thinking and notetaking for the Trifecta. On the other hand, these Figures and Tables are not important, Figure 23.4, the second half of Table 23.2, the parietal cell video, and Figure 23.5. When done properly, when you pause to review important figures/tables, try Questions, and take notes, this assignment should take you more like 70 minutes.

1. ______ For Thursday's lecture, read Chapter 23: Cells in Tissues, first review the introductory page, and then carefully read section 23.1: "How do you break down and absorb nutrients from the food you eat?" (3891 words). As you read it be sure to take handwritten notes.

2. ______ Try to answer these Integrating Questions: #1 about da Vinci, #3 about Prout's research and #7 on Muallem's work and be prepared to share your answers in class.

3. ______ (Trifecta): Prepare to explain (aloud) Tables 23.1, 23.2(first half) and Figure 23.7 in class (Purpose, Methods, Findings).
Week 12

(Preparing for) Tuesday's lecture:

Budgeting homework time (60 min): Read ELSI 1.1 and the first 2/3 of section 1.4 in "Chapter 1: Heritable Material." While this is about 3700 words in both the readings combined, only the 2700 words in section 1.4 need careful reading and notetaking. Also, there are no traditional Trifectas to prepare for, just three simple questions posed below to be ready to answer aloud in class.

1. ________ For Tuesday's lecture, revisit Chapter 1: Heritable Material and read section ELSI 1.1: "Who Owns Your DNA?" (975 words), and then read the first 2/3's of section 1.4 "How does DNA's shape affect its function?" Take notes on section 1.4 all the way up until it switches to the new light blue box topic of "DNA Replication" (2700 words). Read on, don't need to take notes.

2. ________ Try to answer some Integrating Questions and Review Questions.

3. ________ (Tip): Prepare to explain (aloud) in class: 1. What's difference between the chemical structure of DNA vs RNA, 2. What's incorrect in Figure 1.10?, 3. What's incorrect in Figure 1.13?

(Preparing for) Thursday's lecture:

Budgeting homework time (50 min): Read two sections in the chapter Genes and Protein (OSB). Section 15.5 is 2500 words in length and requires careful reading and notetaking. There are no traditional Trifectas, just three simple questions and a task posed below to be ready to answer in class.

1. ________ For Thursday's lecture, read chapter Genes and Proteins (OSB), first review 15.3: "Eukaryotic Transcription" but don't take notes. Then carefully read section 15.5 "Ribosomes and Protein Synthesis" (2501 words) and as you read it take handwritten notes.

2. ________ (Tip): Prepare to explain (aloud) in class: 1. What happens when a gene is going to be expressed?, 2. What happens when a gene is transcribed? 3. Where does folding occur, what if it goes wrong? Also, prepare for this: If Figure 2 is projected on the screen in class be able to go to the board and explain how translation works, using it.
Week 13

(Preparing for) **Tuesday's lecture:**

**Budgeting homework time (60 min):** Chapter 2, section 2.1 (first half) is 2257 words in length with three data tables and figures that require thinking and notetaking for the Trifecta. Reading at 200 words per minute would mean the section might take 12 minutes to read. Yet figures 2.5 and 2.6 are challenging and require time to think and read about them for the Trifecta. Of course, when done properly, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 60 minutes.

1. _______ **For Tuesday's lecture,** review the introductory page of **Chapter 2: Central Dogma.** Then carefully read section 2.1: "How does DNA communicate information to the cell?" (2257 words) and take handwritten notes in your lecture notebook.

2. _______ **Try to answer some** Integrating Questions and **Review Questions.**

3. _______ (Trifecta): **Prepare to explain (aloud) Figures 2.3, 2.5 and 2.6 in class** (Purpose, Methods, Findings).

(Preparing for) **Thursday lecture:**

**Budgeting homework time (60 min):** Chapter 2, section 2.4 is 2673 words in length with several exercises that require you to use NCBI to look for the insulin gene, find introns, and then the ORF finder to understand the gene further. Reading at 200 words per minute would mean the section might take 12 minutes to read. Yet integrating questions 35-38 are challenging and require time to think and perform what they request of you. Of course, when done properly, when you really try to do the Integrating Questions, and take notes, this assignment will take you more like 60 minutes.

1. _______ **For Thursday's lecture,** read another section of **Chapter 2: Central Dogma.** Carefully read section 2.4: "Can cells pick and choose information? (2257 words) and take handwritten notes in your lecture notebook.

2. _______ **Perform the exercises** outlined in **Integrating Questions 35-38** and then answer the remaining IQs and **Review Questions.**

3. _______ (Tip): **Prepare to explain (aloud) in class:** how to use online tools at NCBI and OMIM to find the DNA, RNA and amino acid sequence of any gene, with insulin as an example.

(optional leisure reading for those who are interested and haven't noticed this yet): **Ch.22-ICB: section 22.1,** "How do genetic diseases affect cells and organisms" which has a great section on the genetic disease Sickle Cell Anemia.)
Week 14

(Preparing for) **Tuesday's lecture:**

**Budgeting homework time (60 min):** Chapter 10, section 10.4 (first half) is 3000 words in length with three data figures that require thinking and notetaking for the Trifecta. Reading at 200 words per minute would mean the section might take 15 minutes to read. Yet all three trifecta figures will require time to think and read about them for class. Thus, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 60 minutes.

1. _______ **For Tuesday's lecture,** read the introductory page of Chapter 10: Cellular Respiration and read section "10.4: How is ATP produced?" Take notes on section 10.4 all the way up until Figure 10.22 (2900 words). After that please read but do not take notes.

2. _______ **Try to answer some** Integrating Questions and Review Questions.

3. _______ **(Trifecta):** Prepare to explain (aloud) Figures 10.20, 10.21 and 10.22 in class (Purpose, Methods, Findings)

(Preparing for) **Thursday's lecture:**

**Budgeting homework time (20 min):**

1. _______ **For Thursday's lecture,** read ELSI 10.1 (1000 words) and BME-10.1 (385 words). No notes necessary.

Week 15

This week is comprised of a **Pop-up Journal Club** on Cancer, and then one on Gene Therapy.

(Preparing for) **Tuesday lecture:** **Pop-up Journal Club** on Cancer

**Budgeting homework time (30 min):** You'll be pointed to an online paper that's three pages long to read and bring a hard copy to class.

(Preparing for) **Thursday lecture:** **Pop-up Journal Club** on Gene Therapy

**Budgeting homework time (30 min):** You'll be provided the hard copy of a gene therapy paper to read for Thursday's class.