LIFE210 - Introductory Eukaryotic Cell Biology

Lecture: Section 1: Clark A104, 12:00-12:50 PM MWF

Honors Recitation (Life 211): Section R90: MRB 123, 11:00-11:50 AM R

Instructor (1st half): Steven Markus
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Office Hours: Mondays, 9:00-10:00 am (except for 8/26, 9/2, 11/25 and 12/16)
Molecular and Radiological Biosciences (MRB) 230
*To meet your TAs outside this time, contact them for an appointment.*

Or Essential Cell Biology, 5th edition by Alberts et al. 2019

Course Objectives

• Understand essential concepts and fundamental definitions in cell biology that are necessary to further grasp biochemistry, and broader biomedical issues.
• Learn major components and (bio)chemical reactions involved in the basic cellular processes. Cell biology is the molecular and chemical underpinnings of how and why life (cells and organisms) works. This course only explores the “tip of the iceberg” but will provide a springboard for anyone who wants to delve into cell biology in greater depth.
• Learn to apply the acquired knowledge to problems and questions through critical thinking and problem solving exercises.

How to Do Well

To help you best understand the course content, we will provide you with the following: (1) 8 unit outlines; (2) lecture slides to be posted to Canvas; (3) clicker questions that were presented in class; and (4) example exams (pending availability, and up to the instructor’s discretion). You are expected to come to class prepared (i.e., know something about what we will talk about). Typical preparation involves reading the assigned textbook pages (see below), and looking over the lecture notes for each lecture. If you do not have a good understanding of the material raised by the clicker questions, ask about them at the beginning of the next class, and/or make an appointment to go over them individually with the TA. Use the quizzes, lecture notes, outlines, and clicker questions to guide your studying for the exams. Study your notes including key terms and concepts, and then take the quiz the first time without your notes. If you do not do as well as you would like, review your notes again and take the quiz a second time with your notes and book open (you get two attempts at each quiz!). Finally, we strongly suggest that you practice diagramming some of the key biochemical/cell biological processes on a white board or note paper multiple times rather than just looking them over to study. You will find that the information is retained much more readily, and you will recognize gaps in your understanding more readily. Using this approach in a study group is even more effective. Free tutoring is available in the Arts and Sciences Tutorial Hall from 5 - 10 pm, Sunday through Thursday. For more details see: https://tilt.colostate.edu/learning/tutoring/
### Syllabus

<table>
<thead>
<tr>
<th>Date</th>
<th>Period</th>
<th>Topic</th>
<th>Text Reading (page #s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit 1: Chemistry of Cells – An Overview</strong></td>
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<tr>
<td>Aug 26</td>
<td>SM1</td>
<td>Introduction and course overview &amp; Unity and diversity of cells; definition of cancer</td>
<td>8-14; 35-42; 1205-13; 1224-5; 45-48</td>
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<tr>
<td>Aug 28</td>
<td>SM2</td>
<td>Chemical composition of cells</td>
<td>8-12; 31-39; 1091-97; 1127-29</td>
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<tr>
<td>Aug 30</td>
<td>SM3</td>
<td>Chemical bonds, Part I</td>
<td>12-44</td>
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<tr>
<td><strong>Quiz 1 due @ noon Tuesday, September 3</strong></td>
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<tr>
<td>Sep 2</td>
<td></td>
<td><strong>Labor Day - NO Class</strong></td>
<td>106 (panel 2-1); 90 (panel 2-1)</td>
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<tr>
<td>Sep 4</td>
<td>SM4</td>
<td>Chemical Bonds, Part II</td>
<td>12-44</td>
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<tr>
<td>Sep 6</td>
<td>SM5</td>
<td>Molecules found in cells, Part I</td>
<td>51-53</td>
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<td><strong>Quiz 2 due @ noon Monday, September 9</strong></td>
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<tr>
<td>Sep 9</td>
<td>SM6</td>
<td>Molecules found in cells, Part II</td>
<td>55-65; 65; 153; 157-8</td>
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<tr>
<td><strong>Unit 2: Macromolecular Structure and Function: Proteins</strong></td>
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<tr>
<td>Sep 11</td>
<td>SM7</td>
<td>Amino acids, Peptide Bonds &amp; Intermolecular interactions</td>
<td>125-127; 128-129 (panel 3-1)</td>
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<tr>
<td>Sep 13</td>
<td>SM8</td>
<td>Protein structure and folding</td>
<td>130-131; 134-135; 142-151</td>
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<td><strong>Quiz 3 due @ noon Monday, September 16</strong></td>
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<td>Sep 16</td>
<td>SM9</td>
<td>Proteins as catalysts I</td>
<td>72-77; 158-161; 164-166</td>
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<td>Sep 18</td>
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<td><strong>Review for Exam 1</strong> In class!</td>
<td>12-44</td>
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<td>Sep 20</td>
<td>E1</td>
<td>EXAM 1 (covering lectures SM1-9)</td>
<td>12-44</td>
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<tr>
<td>Sep 23</td>
<td>SM10</td>
<td>Proteins as catalysts II</td>
<td>(same as Sept. 16)</td>
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<td><strong>Unit 3: Macromolecular Structure and Function: Lipids and Membranes</strong></td>
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<tr>
<td>Sep 25</td>
<td>SM11</td>
<td>Membrane composition and assembly</td>
<td>617-625; 626-629; 565-72; 573-76</td>
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<tr>
<td>Sep 27</td>
<td>SM12</td>
<td>Membrane proteins</td>
<td>629-635; 576-82</td>
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<td><strong>Quiz 4 due @ noon Monday September 30</strong></td>
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<tr>
<td>Sep 30</td>
<td>SM13</td>
<td>Solute diffusion and transport across membranes</td>
<td>651-55; 667-69; 597-601; 611-14</td>
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<tr>
<td>Oct 2</td>
<td>SM14</td>
<td>Solute diffusion and transport across membranes</td>
<td>673-75; 654-58; 659-63; 600-04; 606-08</td>
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<td>Oct 4</td>
<td>SM15</td>
<td>Transmembrane transport in disease</td>
<td>663; 665-67; 609-11</td>
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<td><strong>Quiz 5 due @ noon Monday October 7</strong></td>
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<td><strong>Unit 4: Metabolism – Flow of Matter and Energy in Cells</strong></td>
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<td>Oct 7</td>
<td>SM16</td>
<td>Overview of cellular metabolism I</td>
<td>65-72; 77-83; 88-93; 96-100; 101-03; 81-5</td>
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<tr>
<td>Oct 9</td>
<td>SM17</td>
<td>Overview of cellular metabolism II</td>
<td>51-6; 63-8; 73-8; (same as Oct. 5)</td>
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<tr>
<td>Oct 10</td>
<td></td>
<td><strong>Review for Exam 2</strong> On Thursday evening!</td>
<td>81-5</td>
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<tr>
<td>Oct 11</td>
<td>E2</td>
<td>EXAM 2 (covering lectures SM10-16)</td>
<td>81-5</td>
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Unit 5: Intracellular Compartments, Protein and Lipid Sorting

Oct 18 SDP20 Compartmentalization of cells 26-30; 695-704 24-28; 641-49

Quiz 6 due @ noon Monday October 21

Oct 21 SDP21 Protein sorting to cellular compartments I 704-20 649-66
Oct 23 SDP22 Protein sorting to cellular compartments II 723-45 669-91
Oct 25 SDP23 Protein sorting to cellular compartments III 749-79 695-722

Quiz 7 due @ noon Monday October 28

Oct 28 SDP24 Lipid and protein sorting IV 779-809 722-50

Unit 6: Cellular Communication

Oct 30 SDP25 Principles of cell signaling 879-904 813-831; 874-76

Oct 31 **Review for Exam 3** On Thursday evening!

Nov 1 E3 EXAM 3 (covering lectures SM17-19 & SDP20-24)

Nov 4 SDP26 Membrane receptors/G-proteins 904-21 832-49
Nov 6 SDP27 Enzyme-linked receptors 921-45 850-67
Nov 8 SDP28 Signaling through proteolysis 946-55 867-75

Unit 7: Cell Shape and Movement

Quiz 8 due @ noon Monday November 11

Nov 11 SDP29 Molecular dynamics of the cytoskeleton 965-91 889-960
Nov 13 SDP30 Regulation of cytoskeletal dynamics I 992-97 889-960
Nov 15 SDP31 Regulation of cytoskeletal dynamics II 997-1010 889-960

Quiz 9 due @ noon Monday November 18

Nov 18 SDP32 Motor proteins 1010-25 889-960
Nov 20 SDP33 Cytoskeleton and cellular behavior 1025-50 889-960

Nov 21 **Review for Exam 4** On Thursday evening!

Nov 22 E4 EXAM 4 (covering lectures SDP25-31)

Nov 25-29 Fall Recess/Thanksgiving Break – No Classes

Unit 8: Cellular Growth Control

Dec 2 SDP34 Cell cycle I: An overview 1053-60 963-967
Dec 4 SDP35 Cell cycle II: Regulation 1060-1112 967-1018
Dec 6 SDP36 Programmed cell death 1115-28 1021-32

Quiz 10 due @ noon Monday December 9

Dec 9 SDP37 Cellular senescence 292-94; 505 262-265; 442-444
Dec 11 SDP38 Cell biology of cancer I 1205-40 1091-1141
Dec 13 SDP39 Cell biology of cancer II 1241-65 1091-1141
Dec 16 E5 4:10-6:10 pm, EXAM 5 (covering lectures SDP32-39; in Clark A104)
**Last add/drop and W-drop days**

- **Wednesday September 11** – last add/drop day; you will have taken 2 quizzes by then.
- **Monday October 21** – last course withdrawal day (with W grade); you will have taken 6 quizzes & 2 exams by then.

**iClickers**

You will want to purchase an iClicker remote for in-class participation. iClicker is a response system that allows you to respond to questions we pose during class; you will receive extra credit points for that feedback and/or participation. In order to receive this credit, you will need to register your iClicker remote by the first Friday of the semester (**August 30th, 2016**).

**For Web Registration:**

To register your iClicker, go to the following website for instructions:

[https://wsnet2.colostate.edu/cwis6/ttcpdf/how_to/iclicker/iclickerRegistration.pdf](https://wsnet2.colostate.edu/cwis6/ttcpdf/how_to/iclicker/iclickerRegistration.pdf)

**iClickers will be used every day in class, and you are responsible for bringing your remote daily.**

**Quizzes and Exams**

1. **10 Quizzes – 50 points total**
   - There will be 10 quizzes each worth 5 points. They will all be administered on Canvas. They will be posted every Friday (see course schedule above), except the Fridays of the four exams and will be due on the following Monday before class time (noon; except for Quiz 2, which is due on Tuesday September 6 due to Labor Day).
   - There will be 10 quizzes and you will be given two attempts on each.

2. **Exams – 500 points total**
   - There will be five exams each worth 100 points. With the exception of the final exam, the exams will be administered during the regular class time, and in the regular classroom. They will consist of a combination of multiple choice and essay questions. The exams will cover what is discussed in class and what is emphasized in the outlines (see canvas), clicker questions and quizzes.

**Grading**

There are a total of 500 points from Exams, and 50 points from Quizzes. Each of the 5 exams in LIFE 210 will be worth 100 points (500 total), and the 10 weekly quizzes on Canvas are worth 5 points each (50 total), for a cumulative total of 550 points possible. This does not include any bonus points acquired from answering in-class iClicker questions (see below). If you achieve the following point totals for LIFE 210 you will be assured the minimum letter grade shown:

- **1. 495-550 (≥90%)** A
- **2. 440-494 (80-90%)** B
- **3. 385-439 (70-80%)** C
- **4. 330-384 (60-70%)** D
- **5. <330 (<60%)** F

Each exam or quiz will not be curved individually, but the final total points required for a course grade might be curved depending on the averages and distribution of points. In addition, your grade for LIFE 210 will be determined based on the total 550 points (combined). Students in LIFE 210 have averaged around 80% of the total points possible over the past several years. As a result, there is usually no grading curve.

In-class iClicker questions will be worth 1 point for answering irrespective of correctness. These points will be weighted to be worth a maximum total of 20 extra credit points (in addition to the 550 total possible points) at the end of the semester.

**Make-up Exams and Exam Regrading**

There will be no make-up exams offered. Unexcused absences from an exam or quiz will be given a **zero**. If you have an excused absence (based on written or other verifiable evidence) from an exam or quiz, your final grade will be based on a percentage of the total possible points for the exams and quizzes you did take. **Alternatively, students can schedule to take the exam early with the instructor if they know they cannot take the exam at the regularly scheduled date and time.** If you have questions concerning the grading of any
of your exams or quizzes, the questions you want re-graded should be circled and the exam or quiz should be
turned in to the instructor within a week of the date of its return to the class after grading. You must also provide
a written explanation as to why you feel the question should be re-graded. Exams will not be accepted for re-
grading after this one-week period, so go over your exam carefully soon after it has been returned to you.

CSU Academic Integrity Policy and LIFE 210

By registering for this class you enter into a contract between each student (you) and the instructors (us)
constituting an agreement on our respective roles in gaining the knowledge and understanding of cell biology and
earning the grade that you desire. As the instructors, our role is to organize and present the material and stimulate,
facilitate and guide you through learning and understanding the core concepts in eukaryotic cell biology. As the
student, your role is to attend class, not to talk during class unless you are asked to or are asking the instructor
a question and to participate in class discussions and in answering iClicker questions. If you wish to do well in
this course (earn an A or B), we strongly suggest that you attend every class and listen (not text or surf the internet
or watch movies, etc.), use the outlines, clicker questions and lecture notes, form study groups, attend review
sessions, schedule office hours with the instructors and/or the teaching assistants (TAs) to clarify concepts, and
study by practicing rather than merely looking over your notes (please ask us if you do not know what this means).

More specifically, in LIFE 210 the students and the instructors will abide by the Academic Integrity Policy
of CSU as defined in the General Catalog (http://catalog.colostate.edu/general-catalog/policies/students-
responsibilities/#academic-integrity) and the Student Conduct Code (https://resolutioncenter.colostate.edu/
conduct-services/academic-integrity/). While taking an exam, the use of any written material, phones (or similar
electronic devices), or the assistance of others by looking at their exam or communicating verbally or by text,
email, etc. is strictly prohibited. Studying in groups is encouraged. We do suggest that you attempt to complete
the quizzes and clicker questions (when provided) individually first (before meeting in groups) to get the maximum
benefit in your exam preparation. For answering the iClicker questions during class, discussing the possible
answers is strongly encouraged (after attempting to answer them on your own the first time). However, answering
these questions for other students that did not decide to attend class (using multiple iClickers) is not permitted,
and is against the student conduct code.

Maintaining academic integrity is important in LIFE 210 not just to get the most out of the class, but also
because conducting yourself with integrity is core to everyone’s self-worth and societal worth. If you let the small
stuff slide, the next step is justification of doing a poor job, then plagiarism, then cheating on exams, your
homework assignments, your taxes, etc. Even if you are not caught, conducting yourself without integrity eats at
your self-esteem. To learn more visit the Practicing Academic Integrity on the Learning@CSU Website
(http://learning.colostate.edu/integrity/index.cfm).