

**Prerequisites** - BIOL 101

**Instructor** - Dr. Engle

Office - 211 Pierce Hall

Phone - 886-6552

Office Hours - MWF 2-3; TR 12-2; F 11-12

**Credit Hours** - 3

Lecture - MWF 3:00-3:50; 208 Pierce Hall

Email - JEngle@mtaloy.edu

Web page - www.DrEngle.net

**Text** - Alberts, B. et al. 2019 Essential Cell Biology 5<sup>th</sup> ed. W.W. Norton & Company. 734pp. ISBN 978-0-3936-7953-3

### Course description

This course is designed to introduce students to the fundamental concepts of the structure, function and life history of cells and their components. Consideration will be given to the relationship among cell organelles and between cells and their environments.

### Grading

Exams will be given in lecture following each chapter with specific dates announced. Exams will consist of multiple choice, matching, and questions requiring paragraph answers. Exams will be based on both lecture and text book material. The average length of an exam is 50 points.

Papers - Students will write two papers based on a unique peer reviewed experimental scientific journal article. Each paper is worth 50 points and 5 points are awarded for turning in an acceptable article.

Due dates: Topic - **Wed. 2 Feb.**; Background - **Wed. 9 March**; Experimental - **Wed. 20 April**

Scale - A=100-92%, B+=91-88%, B=87-83%, C+=82-79%, C=78-74%, D=73-65%, F=64-0%  
Other grades (E, W, WP, WF) will be assigned as described in the College Catalog.

### External resources

Alberts, B., et al. 2007. Molecular Biology of the Cell 5<sup>th</sup> ed. Garland Science. 1392 pp.

Alberts, B., et al. 2014. Molecular Biology of the Cell (100 Cases) 6<sup>th</sup> ed. Garland Science. 1462pp.

Becker, W.M. et al. 2008 The World of the Cell 7<sup>th</sup> ed. Benjamin Cummings. 912 pp.

Cantley, L. 2014. Signal Transduction 1<sup>st</sup> ed. Cold Spring Harbor Laboratory Press. 452pp.

Chandar, N. & S. Viselli. 2010. Lippincott Illustrated Reviews: Cell and Molecular Biology. LWW. 248pp.

Dennis, E.A. & R.A. Bradshaw. 2011. Transduction Mechanisms in Cellular Signaling: Cell Signaling Collection. Academic Press. 610pp.

Hancock, J.T. 2010. Cell Signaling 3<sup>rd</sup> ed. Oxford University Press. 368 pp.

Karp, G. 2013 Cell and Molecular Biology: Concepts and Experiments 7<sup>th</sup> ed. Wiley. 864pp.

Lim, W., B. Mayer, & T. Pawson. 2014 Cell Signaling: Principles and Mechanisms. Garland Science. 412pp.

Lodish, H., et al. 2012. Molecular Cell Biology 7<sup>th</sup> ed. W. H. Freeman & Co. 973 pp.

Marks, F. et al. 2008. Cellular Signal Processing: An Introduction to the Molecular Mechanisms of Signal Transduction 1<sup>st</sup> ed. Garland Science. 656pp.

Mayer, R.J. ed. 2006. Protein Degradation: The Ubiquitin-Proteasome System (Protein Degradation). Wiley-VCH. 300pp.

Plopper, G. 2014. Principles Of Cell Biology 2<sup>nd</sup> ed. Jones & Bartlett Learning. 566pp.

Walsh, C. 2005. Posttranslational Modification of Proteins: Expanding Nature's Inventory 1<sup>st</sup> ed. Roberts and Co. Publishers. 576pp.

Wilson, J. & Hunt T. 2002. Molecular Biology of the Cell 4<sup>th</sup> ed.: A Problems Approach, Garland Science. 711pp.

In addition to the above policies and procedures, the instructor reserves the right to alter, augment, or delete from existing policies if in so doing the proper atmosphere for teaching and learning is maintained. All such policy changes will be announced.

Course Outline	Learning Objectives	Chapter
<b>Chemical Components of Cells</b>	Students are responsible to read this chapter. While it will not be covered in lecture, material from the chapter will be included on the exam.	2
<b>Protein Structure and Function</b>	Organize and describe the various levels of protein structure Classify protein structural motifs Distinguish protein domains and explain their importance Compare the forces directing protein folding including chaperones Explain how enzymes function on the molecular level Compare the various methods of how enzymes are controlled Describe some examples of post-translational modifications of proteins.	4
<b>Exam 1</b>		
<b>Membrane Structure and Proteins</b>	Diagram the membrane lipid bilayer structure - include lipid content & properties Demonstrate how a plasmid membrane is asymmetrical and why it is important Describe the domains of a membrane spanning protein Explain how membrane proteins can and cannot move around the plasma membrane Describe and relate the importance of the carbohydrate layer on the cell surface	11
<b>Exam 2</b>		
<b>Cell Communication</b>	Give examples and sketch how intracellular receptors function Describe the elements and structure of G protein-coupled receptors Explain how G protein function is down regulated Detail how the receptor tyrosine kinases function Contrast the Ras proteins and the G proteins Explain the functioning of phosphoinositide 3-kinase and its products functions Detail the JAK / STAT signaling pathway Demonstrate the NF- $\kappa$ B signaling pathway	16
<b>Exam 3</b>		
<b>DNA &amp; Chromosome Structure</b>	<ul style="list-style-type: none"> <li>Students are responsible to read this chapter. While it will not be covered in lecture, material from the chapter will be included on the exam.</li> </ul>	5
<b>From DNA to Protein: How Cells Read the Genome</b>	Differentiate the different types of RNA that are produced in the cell Describe how eucaryotic transcription is initiated and the need for transcription factors Explain how introns are recognized and removed in RNA splicing Describe how tRNA molecules are bonded to amino acids Explain how the ribosome can be called a ribozyme Detail how proteins are degraded in the cell	7
<b>Exam 4</b>		
<b>Control of Gene Expression</b>	Predict how different transcriptional switches work Differentiate between procaryotic and eucaryotic transcription regulators Explain how combinatorial control can create different cell types Describe and explain how riboswitches operate Explain how untranslated regions of RNA control translation	8
<b>Exam 5</b>		
<b>Intracellular Compartments and Transport</b>	Illustrate the translocation of proteins across the endoplasmic reticulum membrane Describe the integral membrane protein topological classes Explain how GPI anchored proteins are attached to membranes Illustrate a hydropathy profile Detail protein glycosylation and how glycosylation occurs in the cell Explain how proteins are translocated into the nucleus Predict which proteins are sorted to which organelles Identify the proteins and their functions that are involved in vesicle docking	15
<b>Exam 6</b>		

## MCB Paper Rubric

### Overview

Students are required to choose a molecular cell biology journal article from a peer reviewed journal. Based on that journal article students are required to write two papers. The first paper covers the background of the research. The second paper will detail the experiments covered in the journal article.

### Deadlines

- **Wednesday 2 February, *Journal article*** - A full copy of a peer reviewed scientific research article must be turned in by the student to the instructor for approval. The article should contain about 5 figures and be published within the last ten years.
- **Wednesday 9 March, *Background Paper*** - This paper should expound on the scientific background of the research reported in the article.
- **Wednesday 20 April, *Experimentation and Results Paper*** - This second paper should cover every experiment presented in the journal article.

### Details

- *General Requirements* - Each paper should be typed, double spaced, 12 point, 1 inch margins of text on 8.5 by 11 inch paper.
  - No cover page. The first page should include the student's name in the upper left hand corner followed by the title of the research paper centered. Next should be a one line reference for the journal article. Next a blank line, then begin the text.
  - Indent paragraphs, and do not use I / we / you.
  - The last page should contain the references when necessary. References should be single spaced with a blank line between each reference and in the same format as the chosen scientific article. Each reference should only contain one date and that date should be the date of publication, not the date you accessed the article, except for web pages without a specified publication date.
  - Staple the final copy together to hand in along with a printed copy of the journal article.
- *Background Paper* - This paper should cover the background of the research. Students must explain the biology of the research.
  - Students do not need to include material that is covered in Biology I (BL101). In other words, assume your reader has a general understanding of basic cell biology.
  - Students need to expand the introduction of the journal article.
  - Four peer reviewed references are required for this paper. A text book can count as a peer reviewed reference. You do not need to reference the article you are writing about unless you are presenting data from the article (which is probably not at this point). Use the same referencing style that is used by your chosen article.
  - Web sites may also be referenced in this paper but they do not count as one of the four required references.
  - Generally the paper must be comprehensive enough to communicate to the instructor that student understands the scientific background of the research.
- *Experimentation and Results Paper* - In this paper students should expound on every experiment communicated in the journal article.
  - Begin each section with the question the researchers are attempting to answer.
  - Next explain how the experiment was done.
  - Then explain the results of the experiment in words. You may have to describe the figures but do not reproduce the figures in your paper.
  - Finally summarize the result of the experiment focusing on how the question was answered and transition to the next experiment.
  - The last paragraph of the paper should state the conclusions of the entire research article.
  - References are not necessary for this paper unless you include data from another publication.
  - The student's goal is to communicate to the instructor that you understand how each experiment was done, critique of the results, and articulate the conclusions discovered from the experiments.
- *Point distribution*
  - Body 25 pts. and Overall 25 pts. - Includes grammar, spelling, thought development (flow).
  - Total points = 50 per paper.

PROOF YOUR PAPER

PROOF YOUR PAPER

## **MAC Policies**

### Weather Delays and Compressed Schedule

In the event of a delayed opening, MAC will follow a compressed schedule. This will provide students with the opportunity to attend all scheduled classes on delay days with each class meeting for a shorter than usual session. For the Compressed Schedule for delay days, go to the following link:  
<http://www.mtaloy.edu/delays-cancelations>

### Technology and Communication Assistance Statement

All students are expected to regularly log in to the Canvas course website. The site contains the syllabus and assignments, and supplementary materials will be placed there on a regular basis. Furthermore, important announcements will be posted on the site (especially if a class period is canceled due to weather, illness, etc.). For assistance in using Canvas, please contact the Canvas administrator at (Canvas@mtaloy.edu).

College offices and instructors often communicate important information through the MAC email system. Students should check their school email account regularly. For technical or log-in credential questions, please contact the help desk at (helpdesk@mtaloy.edu or 886-6502).

### College Academic Integrity Statement

Mount Aloysius College is committed to the academic integrity of the entire community. All share responsibility for maintaining high standards of academic integrity, and no forms of academic dishonesty are tolerated. Forms of academic dishonesty include but are not restricted to: giving or receiving unauthorized assistance on an examination, project, or assignment; using unauthorized forms of assistance such as crib notes or cell phones on an examination; falsification of data or plagiarism (using another person's ideas or words as your own); and lying or falsifying reasons for missing examinations or class.

A student found guilty of lying, cheating, or plagiarism, depending on the nature of the offense and the history of the student, is usually subject to one or both of the following: a grade of zero on the assignment, project, or examination or a grade of F in the course. All cases of lying, cheating, or plagiarism where a punishment is incurred are reported to the Senior Vice President of Academic Affairs, who maintains a record of all offenses. Serial offenders may be subject to suspension or dismissal.

### College Accommodations Statement

Mount Aloysius College is committed to providing reasonable accommodations to students with disabilities. Students with disabilities who wish to request an accommodation are required to contact Ms. Marisa Evans, MA, LPC, NCC, Director of Counseling and Disability Services to formally request accommodations and provide supporting documentation. Her office is located in St. Joseph Hall, Room 101, (814) 886-6336. If you receive approval for accommodations, it is important that you stop in during my office hours at the start of the semester so necessary arrangements can be made.

### Attendance Policy

Attendance at all lecture and lab sessions is mandatory. It is your responsibility to notify the instructor prior to missing an exam or laboratory and you must have a valid reason. The instructor reserves the right to judge the validity of the excuse. If you miss an exam, you are responsible for taking the exam within one week of your return. There are no makeup labs unless you are able to come to another section during the same week and obtain instructor permission. *Failure of the student to follow the steps outlined above will result in a grade of "0" for the missed exam or lab!*

### Conflict Resolution

Should a student encounter difficulty with course content or other aspects of the course, the first action should be to make an appointment to speak with the instructor. The instructor may suggest resources on campus or other tips to assist student learning. If a student has concerns with their instructor, then the best course of action is to seek out a meeting with the Science and Math Department Chair, Dr. J. Michael Engle, 814-886-6552, jengle@mtaloy.edu. to discuss the difficulties. If an agreeable decision is not reached, the student should then request a meeting with the Dean, Dr. Chris Lovett, 814-886-6485, clovett@mtaloy.edu. The Faculty, Department Chairs, and Deans are committed to treating all students with respect and fairness. Additional information is outlined in the academic grievance policy in the College catalog.