

I. COURSE DESCRIPTION

Cell Biology explores the fundamental workings of the eukaryotic cell, placing its principal emphases upon the structure and function of biological membranes, the cytoskeleton, the pathways of signal transduction, and the organelles of the endomembrane system. Students who are also interested in details of gene regulation and the pathways of metabolism will find that BIOL-325 (*Molecular Biology*) and CHEM-414 (*Biochemistry*) complement the topics in this course with little duplication. Optional laboratory credit is provided by *Methods in Biochemistry and Cell Biology* (BCMB-310), which also confers laboratory credit to accompany Biochemistry.

The goal of this course is for you to learn more than merely facts (though indeed there will be many facts to learn), but more importantly to develop skills of “cell biological reasoning.” To that end, frequent emphasis will be placed in lecture upon the experimental approach to understanding the workings of cells; and examinations and quizzes will contain numerous questions that expect you to draw conclusions from experimental data or to predict the outcomes of experimental manipulations. It is also hoped you will gain, or increase, a sense of the beauty and wonder of the natural world, and the thrill of discovery, that drive the best scientific inquiry.

Rather than aiming for superficial breadth of coverage, BIOL-307 focuses instead upon a smaller set of topics, treating each in enough detail to let you to build a sound, integrated understanding of the structural and regulatory complexity of life at the level of the cell. We will begin this course where your introductory study of cells and molecules left off – we won't spend time repeating what you should have learned in Core. Appropriate to the intended level of the course, the text is one of the standards used in cell biology courses at the graduate level. Expect to be challenged.

II. GRADING

1. Eighty percent of your grade will be determined by your performance on four equally-weighted examinations. All examinations, including the last, are non-cumulative.
2. Ten percent of your grade will be determined by your performance on brief daily quizzes. Quizzes provide a means for both you and your professor to monitor how well you're learning the material and keeping up in the course. They also give you an advance look at the range and depth of understandings that will be expected of you on exams, as well as a chance to gain practice in working with experimental data and “thinking experimentally”.

Quizzes will be taken on-line through Moodle, which can be accessed through the Rhodes College homepage. Each quiz covers material from the immediately preceding lecture, as well as material from any reading that has been assigned in preparation for that day's lecture. Quizzes will be available during a 24-hour period ending at 9:00 on the morning of lecture. A grade of zero will be assigned to each missed quiz; however, the two lowest quiz grades from the whole

semester will be dropped when calculating the final average. Thus, you may miss two quizzes (whether because of travel, computer difficulty, or personal choice) without penalty.

3. Ten percent of your grade is based upon a 5 – 10 page report on a research article describing a recent discovery in cell biology. You will receive more detailed instructions by the end of the second week of class, including advice on how to excel in your report. The report is due on **Tuesday, November 22nd**, and you must submit two potential article titles no later than **Thursday, November 3rd**.

III. SCHEDULE OF LECTURES AND EXAMINATIONS

Aug.	25	Protein structure: conformation and specificity of ligand binding
	30	Composition and structure of biological membranes
Sept.	1	Membrane fluidity: origins and consequences
	6	The cyclic AMP system plus allosteric and covalent protein modification
	8	The phosphoinositide system and calcium as a metabolic regulator
	13	Receptor tyrosine kinases (Ras/MAP) and cytokine receptors (Jak/STAT)
	15	Diffusion of solutes across biological membranes
	20	Examination from <i>Protein Structure through Receptor Tyrosine Kinases</i>
	22	Review of Examination I
	27	Active transport
	29	The role of proton gradients in energy-requiring processes
Oct.	4	The respiratory membrane
	6	The photosynthetic membrane
	11	Basic biochemistry of actin and myosin
	13	Examination from <i>Diffusion through The Photosynthetic Membrane</i>
	18	No Class – Fall Recess
	20	Review of Examination II
	25	The roles of actin and myosin in cell motility and growth
	27	Microtubules: roles in vesicle transport, cell structure, and motility
Nov.	1	The mitotic spindle
	3	Regulation of the nuclear division cycle/ report article titles due
	8	Post-translational transport of proteins across membranes
	10	Examination from <i>Actin & Myosin through The Nuclear Division Cycle</i>
	15	Co-translational transport of proteins into the ER
	17	The Golgi apparatus: modification of materials received from the ER
	22	Protein sorting and regulation of vesicle traffic/ research report due
	24	No Class – Thanksgiving Recess
	29	Endocytosis
Dec.	1	Cell walls
	6	Course Evaluation
	15	Examination from <i>Post-translational Transport through Cell Walls (8:30 A.M.)</i>

IV. TEXT AND READINGS

The text in the course is Molecular Biology of the Cell, 5th ed., by Bruce Alberts, *et al.*

GENERAL READINGS

The following three topics are important as overall orientations to the study of cells, and they should be read as soon as possible. You aren't expected to learn these things in detail, but you should at least become familiar with what's being discussed (it's just review in many cases) and, especially in the case of *Investigative Techniques*, you should remember that the chapters are there to be consulted when, from time to time, these techniques appear later on in lecture.

As an introduction to the subject	Chapter 1
As a review of basic chemistry	Chapter 2
As a review of investigative techniques	Chapters 8 and 9

READINGS FOR SCHEDULED LECTURES

Below are listed the sections of the book that are most relevant to the topics covered in lecture. You would do well to review each section at least superficially before the corresponding lecture and then to read the same section again in more detail before the exam. Additional specific reading assignments will be made in class.

Protein Structure	ch. 3
Membrane Structure	ch. 10
Metabolic Regulation (cAMP, Ca ⁺⁺ , Phosphoinositides, G-proteins, Ras, Jak)	pp. 904 - 941
Membrane Transport	ch. 11
Proton Gradients, Respiration, Photosynthesis	ch. 14
Cytoskeleton (Actin, Microtubules, Motility)	ch. 16
Mitotic Spindle	ch. 17
Cell Cycle	ch. 17
Post- and Co-translational Transport of Proteins across Membranes	ch. 12
The Golgi Apparatus (Glycosylation, Sorting, Secretion)	pp. 749-787; 799-809
Endocytosis	pp. 787-799
Cell Walls	pp. 1195-1202
and online review article:	
http://www.bio.psu.edu/expansins/reprints/CosgroveNatureRevMCB2005.pdf	

V. AVAILABILITY OF POWERPOINT LECTURE GRAPHICS

Selected preview graphics (mainly certain of the more detailed diagrams) will be available in the course folder on the *Acad_Dept_Pgm* file server in advance of each lecture, in order that you can have them with you in class as a note-taking aid. Full PowerPoints for each topic will be made available following the corresponding lecture.

VI. PREPARATION FOR LECTURES

Each lecture ends with a list of topics to be reviewed before the next class meeting, and questions from these topics will be included on the upcoming quiz. Topics designated as "core level" are material that you should have encountered before, which can be adequately reviewed (or learned for the first time, if need be) simply by studying the appropriate section of a basic biology text. Those topics designated as "advanced" are things you probably haven't encountered before, though they are covered in your cell biology text or other readily available resources.

Some lectures will make specific reading assignments from your textbook or other specified resources. These specially assigned subjects should be learned with the same attention to detail that you use when you're studying the topics that have been covered in lecture.

VII. PREPARATION FOR EXAMINATIONS

Also in the course folder on the *Acad_Dept_Pgm* file server is a document titled "Study Hints". You'd do well to consider its suggestions well in advance of your first examination – and again as well if your performances aren't up to your expectations.

VIII. SPELLING AND GRAMMAR

The use of proper spelling and grammar, which includes the correct use of singular and plural forms of scientific terms of classical derivation, is required on all graded material.

IX. CONTACT INFORMATION

Office: FJ 102E

Hours: T, Th 9:15 – 9:45 (just come by after class); by appointment if necessary

Emails: wthierfelder50@gmail.com ; thierfelderw@rhodes.edu

Cell phone/text messages: 901-283-2989; on campus, 843-3555 (Ms. Thomas will pass on messages)

My availability on campus is very limited, but I am almost always available electronically. Do not hesitate to email, phone, or text message (the preferred order of use is shown above). I will always do my best to return your message within 24 hours.

Timely email communications from the professor carry the same weight as do announcements made in class.