

I. General Information

Course: BIOL 200 Cell Biology

Location: LS 116

Time: MWF 11:00 – 11:50 and W 1:00 – 2:50 (LS 116)

Instructor: Dr. Robert Grier Ph.D.

Office: LSA 222

Office hours: TTH 9:00 – 12:00 or appointment

Phone and email: 672-1368, rgrier@uncfsu.edu

Note: Students are not allowed to contact me at home, no exceptions. This includes your friends and employers.

Examinations: 4 tests and a cumulative final exam. The lowest grade of the four tests will be dropped. Everyone must take the final exam, no exceptions. Three tests and the final exam will be 75% of the total grade for the course. The remaining 25% of the total grade will be from the lab assignments.

The dates for the examinations will be announced in class

Grading scale: A: 100 -90

B: 89 – 80

C: 79 – 70

D: 69 – 60

F: 59 > 0

Missed exam policy:

All make-up exams are oral, no exceptions. Furthermore, it is at the discretion of the instructor to grant a make-up exam. The decision of the instructor in this matter is final.

Attendance: Students are expected to attend every class. Students who are tardy more than three times will be counted as absent. A student who has more than three absences will be dropped from the course.

Lab: All lab assignments must be submitted on time. Late lab assignments will not be accepted. There will be no make-up labs. A student who misses a lab will receive a zero for that lab.

II. COURSE DESCRIPTION

This course is designed for students with minimal backgrounds in biology and chemistry. Its purpose is to help students to fully appreciate the dynamic aspects of cellular structure and function. Emphasis will be placed on analyzing the major hypotheses and concepts of cell biology. Both classical and contemporary topics will be discussed using evidence from experiments conducted with a variety of types of cellular materials. Major techniques used in the study of cellular biology will be reviewed. The course will emphasize the unifying

principles of cell biology and its relationship to other disciplines such as biochemistry, genetics, and molecular biology.

III. TEXTBOOK AND LABORATORY MANUAL

Karp, Gerald (1996). Cell and Molecular Biology. USA: John Wiley & Sons, Inc.
Raynor, James E. (1997) Cell and Molecular Biology Laboratory Manual. USA: Fayetteville State University.

IV. SPECIFIC COURSE OBJECTIVES

The student who successfully masters this course will be able to:

1. Exhibit an understanding of the basic organization of cell structures.
2. Summarize classical and historical events that resulted in the development of contemporary cell biology.
3. Demonstrate an understanding of the basic features of organic molecules.
4. Exhibit an understanding of how genetic information is stored, utilized and controlled in DNA synthesis and in protein synthesis.
5. Explain packaging and organization of the genome.
6. Explain membrane and cell surface phenomena.
7. Demonstrate an understanding of mitochondrial respiration and electron transport.
8. Describe chloroplast bioenergetics.
9. Explain microtubule-based motility and microfilament-based motility.
10. Demonstrate an understanding of the molecular and cellular aspects of diseases such as cancer, AIDS, and genetic diseases.
11. Communicate an understanding of cell biology through well organized, correctly structured and concisely written presentations of discussion question responses and reading reports.
12. Discuss modern techniques used to study the biology of the cell.
13. Demonstrate knowledge of the language of cell biology through vocabulary assignments.

Chapter 1: Introduction to the study of Cell Biology) (1.1, 1.13, 1.2, 1.3, 3.0, 3.3)

Define Cell Biology, Hooke, Anton van Leeuwenhoek, Schleiden, Schwann, Virchow, Basic properties of cells, prokaryotic and eukaryotic cells, archaeobacteria and eubacteria, unicellular and multicellular, viruses, viron, viroid, provirus, lytic infection, prion.

Chapter 2: The Chemical Basis of Life ((((1.4, 1.6, 1.9)

Atom, element, group #, period, molecule, compounds, electronegative, chemical bonding, cations, anions, covalent bonds, noncovalent bond and interactions, polar, nonpolar, hydrophobic, hydrophilic, properties of water, acids, bases and

buffer, pH, amphoteric, organic chemistry, hydrocarbons, saturated and unsaturated, functional groups, macromolecules, monomers, polymers, dehydration synthesis, carbohydrates, lipids, proteins (how primary, secondary, tertiary, and quaternary levels are destroyed) levels, and nucleic acids (how are primary and secondary levels are destroyed). Learn the “**OFEEBO**” classification system of macromolecules.

Chapter 3: Energy, Enzymes, and Metabolism)) (1.4, 1.6, 1.9)

Define energy: potential and kinetic, laws of thermodynamics, free energy, entropy and enthalpy, endogonic, exogonic, spontaneous, nonspontaneous, enzymes, cofactors, coenzymes, inorganic catalysts, active-site, reactive-site, lock-and-key model, induced-fit model, enzyme kinetics Michaelis-Menten and Lineweaver-Burk plots, catabolic, anabolic, oxidation, and reduction.

Chapter 4: The Structure and Function of the Plasma Membrane)) (1.4, 1.6)

Define membrane functions, membrane structure: lipid (Phosphoglycerides, sphingolipids, cholesterol), proteins (peripheral and integral, monotopic, polytopic), and carbohydrates (glycoproteins, glycolipids), fluid-mosaic model, amphipathic, simple diffusion, facilitated diffusion, active transport.

Chapter 5: Aerobic Respiration and the Mitochondrion ((((1.4, 1.9)

Define the mitochondrial structure and function, glycolysis, aerobic respiration, fermentation, TCA cycle, NADH, FADH₂, ATP synthesis, Electron Transport System, coupling and uncoupling ATP synthesis.

Chapter 6: Photosynthesis and the Chloroplast)) (1.14, 1.20, 1.4, 1.9)

Define the structure (outer and inner membrane, thylakoid membrane and stroma) and function of chloroplasts, activities associated with each region, chemoautotrophs, photoautotrophs, photosynthesis: light and dark reactions.

Chapter 8: Cytoplasmic Membrane Systems: Structure, Function, and Membrane Trafficking ;;; (1.3, 1.7, 1.9)

Define transport vesicles, cytoskeleton tracts, Biosynthetic-secretory pathway, endocytic pathway, secretory activity-constitutive and regulated, structure and function of ER-smooth and rough, Two classes of proteins: **domesticated**, **secretory**, signal hypothesis, translation, cotranslational processing, signal sequences, synthesis of lipids and carbohydrates, structure and function of Golgi apparatus, fuzzy coats, clathrin and non-clathrin coats, KDEL and KKXX signal

sequences, Sorting of lysosomal proteins, structure and function of lysosome, vacuoles, peroxisomes, endocytosis: Bulk phase, Receptor-mediated endocytosis (RME), Early and late endosomes, HDLs, LDLs and cholesterol Metabolism.

Chapter 9: The Cytoskeleton) (1.3, 1.7)

Define function of cytoskeleton: microtubules, microfilaments, intermediate filaments. 9+2 arrangement, flagella.

*****Information is located in Laboratory manual*****

Chapter 10: The Nucleus ;;;; (1.9)

Define the structure and function of the nucleus, nuclear pore complex (NPC), organization of Genetic material, forms of DNA, DNA replication: Unwinding, priming and polymerization, unidirectional fork movement, enzyme and factors of DNA replication, priming enzymes.

Chapter 11: Transcription and Translation ;;;; (1.10, 1.12, 1.9)

Define the structure and function of RNA, transcription, RNA polymerase, promoter, operon, transcription and processing of RNAs, Regulation of gene expression.

Chapter 12: Signal Transduction, Apoptosis, and Cancer))

Define signal transduction, function, activation of membrane protein kinases, activation of protein kinases via G-protein, activation of adenylate cyclase, activation of phospholipase C, function of cAMP in liver, apoptosis, Tumor Necrosis Factor, p53, p21, CASPASES, cytochrome c, BCLx, BCL₂, Cancer, LiFraumeni Syndrome, carcinogens, benzopyrenes, tumor, metastasize, secondary tumors, Radiation, and Chemotherapy: 5-fluro-UTP.

V. COURSE OUTLINE WITH ASSIGNMENT SCHEDULE:

WEEK/ DATES	CHAPTER	TOPIC
Week 1	1	Introduction of Cell Biology: Evolution
Week 2	2: Exam #1	Chemical Basis of Life
Week 3	3	Energy, Enzymes, and Metabolism
Week 4	3	Energy, Enzymes, and Metabolism
Week 5	4 Exam #2	Plasma Membrane

Week 6	5	Mitochondria
Week 7	5, 6: Exam #3	Mitochondria, Photosynthesis
Week 8	8	Cytoplasmic Membrane Trafficking
Week 9	8	Cytoplasmic Membrane Trafficking
Week 10	8	Cytoplasmic Membrane Trafficking
Week 11	9, 10	Cytoskeleton. Nucleus
Week 12	10: Exam #4	Nucleus, DNA Replication
Week 13	11	Transcription, Translation
Week 14	11, 12	Translation, Signal Transduction, Apoptosis, and Cancer
Week 15	12: FINAL	

VIII. HELPFUL WEBSITES AND REFERENCES:

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<http://www.geocities.com/siliconValley/5504/biochem.html>

<http://medic.med.uth.tmc.edu/path/00001450.htm>

References

The textbooks listed below are good supplemental books for this course. Each of these books is available in the C. W. Chesnutt Library. Other selected references at the end of each chapter will be recommended.

1. Alberts, B., et al. (1989). Molecular biology of the cell (2nd ed.) New York: Garland Publishing.
2. Loewy, A.G., et al. (1991). Cell structure & function : an integrated approach (3rd ed.). Philadelphia: Saunders College
3. Sadava, D. (1993). Cell biology: organelle structure & function. Boston: Jones & Bartlett.
4. DeRobertis, E.D.P. & DeRobertis, E.M.F. (1987). Cell & molecular biology (8th ed.). Philadelphia: Lea & Febiger.
5. Voet, D. & Voet, J.G. (1990). Biochemistry. John Wiley & Sons: New York.
6. Kornberg, A. (1992). DNA replication (2nd ed). New York: W. H. Freeman.
7. Darnell, J., Lodish, H., and Baltimore, D. Molecular Cell Biology. New York, Scientific American Books, 1986.
8. Brown, W.H. (1987). Introduction to organic & biochemistry (4th ed.). Monterey, CA: Brooks/Cole Publishers.

Students are encouraged to review each current issue and read appropriate articles in the following journals, also available in the C. W. Chesnutt Library:

Cell, Journal of Cell Biology, Journal of Molecular Biology, Nature, Science, Scientific American, Trends in Biological Sciences (TIBS), Bioessays

Students having difficulty with this course are encouraged to seek assistance through Student Support Services Tutorials, computer assisted instruction, or special study sessions. See your instructor for further information.

IX. CLASS BEHAVIOR AND ATTENDANCE:

CELL PHONES AND PAGERS HAVE BECOME INCREASINGLY PROBLEMATIC IN THE CLASSROOM DUE TO THEIR UNTIMELY DISTRACTIONS. DURING CLASS TIME, THESE EQUIPMENTS SHOULD BE TURNED OFF OR SILENCED. IF A STUDENT'S CELL PHONE OR PAGER SOUNDS DURING CLASS, THE STUDENT WILL RECEIVE A FIRST WARNING, AND MUST LEAVE THE CLASS FOR THAT PERIOD. ON THE SECOND OFFENSE, THE STUDENT WILL BE ASKED TO LEAVE AND NOT BE ALLOWED TO RETURN TO CLASS FOR THE DURATION OF THE SEMESTER. THERE WILL BE NO EXCEPTIONS!!!!

Attendance is mandatory. The university attendance policy will be observed. Students who miss more than 10% of the scheduled classes will receive a grade of **WN**. This course meets for 30 classes, so a student who misses more than 3 classes will have exceeded the limit and will be subject to a **WN** grade. Students receiving a **WN** grade may appeal the grade to the instructor by providing documentation for excused absences. Appeals are subject to approval by the instructor, department chair, and dean. Students withdrawn from a class due to non-attendance are NOT relieved of the financial obligation to pay for the class. The only way that a student is relieved of the financial obligation to pay for a course is by officially dropping the course. Students not present when attendance is taken at the beginning of each class period will be marked as absent. It is the responsibility of the student arriving late to see the instructor after class to confirm his/her presence. The student is responsible for any material missed due to tardiness. Excessive tardiness will not be tolerated, as this is disruptive to the class and detrimental to the students. Students are expected to behave as responsible adults. The instructor will observe zero tolerance for insubordination and cheating in the classroom. In both cases, appropriate measures will be taken in the classroom (ie, cheating will result in a zero) and any incident will be reported to the departmental chair and dean.

**FALL 2006 CELL AND MOLECULAR BIOLOGY
LABORATORY SCHEDULE**

Aug. 28- Sept. 1 ↖	Microscope & Identification of Biological Molecules: Reducing Sugars, Proteins, and Lipids
Sept. 4-8	Labor Day Holiday- No Lab
Sept. 11-15 ^	Enzyme Kinetics: Establishing a Base Curve Enzyme & Effect of concentration, pH, temperature, and inhibitors
Sept. 18-22 ∨	Respiration, Fermentation and Photosynthesis
Sept. 25-29 ↔	Laboratory Calculations I: (Factor/ Label unit conversions, proportions, and Molarity)
Oct. 2-6 ←	Laboratory Calculations II: Kool Aid For Thought
Oct. 9-13	Fall Break- No Lab
Oct. 16-20 ↑↑	Biotechniques: Introduction to Biotechniques & pipetting and gel electrophoresis exercises
Oct. 23-27 ⇒	DNA Transformation of pGlo plasmid DNA
Oct. 30- Nov. 3 ⇓	Plasmid DNA Isolation & DNA Restriction Analysis
Nov. 6-10 ◇	Gel Electrophoresis
Nov. 13-17 ⟨	Polymerase Chain Reaction (PCR amplification of ALU gene from buccal cells) & Gel Electrophoresis
Nov. 20-24	Thanksgiving Holiday-No Lab
Nov. 27-Dec. 1	Final Lab Exam

