

GENERAL BIOLOGY – BIO 211
Fall, 2006
SYLLABUS

Instructor: Professor Helen Asemota
Office: Room 209, Roberts Science Hall
Office Hours: TTh 1:00-3:30;
MW 9:30 – 12:00noon
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Text: Sylvia S. Mader. 2004. Biology, 8th Edition. William C. Brown Publishers.

Laboratory: Handouts

General Description:

General biology is the foundation course for biology, chemistry, mathematics, computer science, physics, environmental science, education, and kinesiotherapy majors. The course is designed to provide the student with the fundamental principles of biology, emphasizing the unity and diversity of living things from the atomic level of organization to the systemic level.

Specific Competencies:

The student should:

1. be able to categorize living things and know the characteristics shared by all.
2. understand the scientific method and its significance.
3. know the organization of living things from the atomic to the systemic level.
4. be able to describe the structural and functional activities of living things at the molecular and cellular levels of organization.
5. understand the mechanisms of inheritance at the level of the organism, utilizing principles emanating from Mendel's discoveries.
6. understand the mechanisms of inheritance at the molecular level of organization.
7. know the theoretical concepts implicit in the field of biotechnology, their applications, and how they might be used to change the course of natural events.
8. be able to classify living things according to the binomial system.
9. be able to describe the general characteristics associated with each of the six kingdoms of living things.
10. be able to discuss the interrelationships between the circulatory system, diet, and heart disease.
11. be able to describe the processes associated with the reproductive system.

North Carolina State Competencies:

- 1.0 Understanding the Nature of Science: processes and content.
 - 1.1 Knowledge of basic principles and concepts and their interrelations.
 - 1.3 Interrelationships between science and other academic areas.
 - 1.5 Knowledge of historical development of scientific concepts.
- 3.0 Appropriate science teaching methods and a favorable learning environment.
 - 3.2 Science content into instructing using equipment and technology.

- 1.0 Biology-Specific Competencies.
 - 1.1 Differences between living and non-living things/scientific theories.
 - 1.2 The cell, chemical composition, structure, function.
 - 1.3 Life processes-synthesis, digestion, respiration, photosynthesis.
 - 1.4 Homeostasis at the cell, organism, population levels.
 - 1.5 Anatomy, physiology of major taxonomic groups.
 - 1.6 Principles of genetics and the chemical basis of heredity.
 - 1.7 The evidence and mechanisms for organic evolution, including humans.
 - 1.8 The response of organisms to environmental variations.
 - 1.9 The diversity and classification of organisms.
 - 1.10 The relationship of biology to human health.
 - 1.11 Ecology - populations, communities, ecosystems, interactions
 - 1.12 Human development/reproduction with emphasis on health issues.
- 4.0 Relate concepts and principles of biology.
- 6.0 Use and care for living organisms in an ethical and appropriate manner.

Assignments:

Three in-class examinations, covering the lectures, reading and homework assignments, and laboratory exercises will be given during the course. The specific examination date will be announced at least one week in advance. From time to time, unannounced quizzes will be given and homework assignments made to promote discipline and consistent study habits.

Attendance:

Class attendance is required of all students. For the current course, the student is allowed a maximum of **two** unexcused absences. **“Students who exceed the maximum number of absences may receive a failing grade for the course”, in accordance with University policy as stated in the University catalogue.** Laboratory attendance is particularly important since there will be no make-up laboratories due to preparation time and frequent use of live specimens. Laboratory reports will be prepared as described by the instructor and will be due no later than one week following the completion of the laboratory module.

Topical Outline:

Page (s)

Chapter 1. Introduction	
How to define Life	1-5
Organization of Biosphere	6-7
The Classification of Living Things	8-9
The Process of Science	10-14

Chapter 2. The Formation of Molecules from Atoms

Atoms and the Formation of Molecules and Compounds	19-26
Water, Solubility Properties, pH, and Buffers	27-31

Chapter 3. The Molecules of Life	
Introduction	35-38
Carbohydrates	39-41
Lipids	42-45
Proteins	46-49
Nucleic Acids	50-52

Chapter 4. Cell Structure and Function	57
Cellular Level of Organization	58-61
Prokaryotic Cells	62-63
Eukaryotic Cells	64-79

Chapter 5. Structure and Function of Membranes	83
Membrane Models	84-87
Membrane Transport	88-95

Chapter 7. Photosynthesis	115
Photosynthetic Organisms	116-117
Solar Energy Conversion	118-123
Carbohydrate is Synthesized	124-127

Chapter 8. Cellular Respiration/The Production of ATP	
Introduction	131-133
Stage One: Glycolysis	134-135
Stage Two: The Oxidation of Pyruvate	136
Stage Three: The Krebs Cycle	137
Stage Four: The Electron Transport Chain	138-139
Fermentation	142-143
Metabolic Pool	144

Chapters 9 and 10. Cell Division	
Mitosis	149-161
Binary Fission	162-163
Meiosis	167-177

Chapter 11. Mendelian Genetics	
Introduction	181-183
Monohybrid Crosses	184-188
Dihybrid Crosses	189-192
Human Genetics and Disorders	193-199

Chapter 13. DNA Structure and Function	233

The Discovery of the Genetic Material	224-226
DNA Structure	227-229
DNA Replication	230-233

Chapter 14. The Expression of Genes	
Introduction	237-241
Transcription	242-244
Translation	244-248

Chapter 16	
Recombinant DNA and Biotechnology: A Biological Revolution!	267-276

Chapter 20	
The Classification of Organisms	341-356

Chapter 21	
Viruses and Bacteria	361-375

Chapter 22	
Protists/Algae and Protozoa	379-394

Chapter 23	
Fungi	397-409

Chapter 24	
Plants	413-433

Chapters 29-31. Animals	
Invertebrates	517-532
The Protosomes	535-551
The Deuterostomes	555-574

Chapter 34. The Circulatory System	611-621
Cardiovascular Disorders in Humans	622-624

Chapter 52	
Selected Topics on Reproduction	773-791

Evaluation:

The final grade will be calculated as follows:

Best two one-hour examinations.....	40%
Laboratory reports.....	20%
Homework & assignments	10%
Class Quizzes	10%
Final examination.....	20%

Grading Scale:

- 90 - 100 = A
- 80 - 89 = B
- 70 - 79 = C
- 60 - 69 = D
- 59 or below = F

Bibliography of Supplementary Readings:

A bibliography of relevant articles and/or Web connections is found at the end of each chapter. Refer to the bibliography as needed. Selected readings will also be assigned.

Topical Laboratory Outline:

1. The microscope
 - a. identification and labeling of parts
 - b. focusing exercise
2. Levels of organization
 - a. atoms
 - b. molecules
 - c. construction of shell models of atoms and molecules
 - d. developing structural formulas of molecules
3. Acids, bases, and pH
 - a. the relationship between $[H^+]$ and acidity and alkalinity
 - b. pH titration exercise
4. The molecules of living things
 - a. testing for the presence of carbohydrates, proteins, lipids
 - b. the structural formulas of carbohydrates, proteins, lipids
5. The cell theory
 - a. prokaryotic and eukaryotic cells
 - b. plant and animal cell structure and function
6. Membrane transport
 - a. demonstration of diffusion and osmosis via dialysis
 - b. comparison of the transport of starch, glucose, and iodine
7. Photosynthesis
 - a. demonstration of photosynthesis by elodea as determined by CO_2 uptake and O_2 evolution
 - b. rate of photosynthesis using green and white light

8. Cellular respiration
 - a. fermentation vs respiration
 - b. indicated by gas formation and O₂ uptake, respectively

9. Mitosis and meiosis
 - a. the stages of mitosis and meiosis
 - b. production of diploid vs haploid cells

10. Human genetics
 - a. mendelian problems
 - b. punnett square solutions

11. Biotechnology
 - a. DNA fingerprinting - RFLP analysis
 - b. PCR amplification of DNA

12. Plant kingdom survey - taxonomic groupings

13. Animal kingdom survey – taxonomic groupings