

Instructor: Dr. Sara Fenske

Course: Honors Biology

Academic Year: 2008-2009

Course Philosophy: Biology is the study of life. It is the study of how organisms (such as ourselves) develop, function, and reproduce. As you will find, this is an incredibly complex and fascinating science. In this course you will learn the concepts and techniques of modern biology. The goal of this course is to prepare you to take the SAT II Biology M Test. Hopefully, it will also instill in you an appreciation, perhaps even a love, of this incredible science. The success of this course depends on your enthusiasm, hard work, and participation.

Course Requirements:

- 1) Biology Concepts & Connections 6th edition by Campbell, Reece, Taylor, Simon, and Dickey
- 2) Biology Concepts & Connections Study Guide
- 3) Binder for Handouts and paper for notes
- 4) Pencil or Pen (blue or black)
- 5) All handouts
- 6) Netbooks and access to the internet

Grading Procedure: Grades are based on a combination of a major exam, tests (including SAT II practice tests), quizzes, writing assignments (including lab reports). Tests will be worth twice as much as quizzes and lab reports. As stated in the Student Handbook, "To emphasize the importance of growth through the school year, the weight of each trimester grade has been changed. The first trimester will count as 15%, the second as 25%, the third as 35%, the mid-year exam as 10%, and the final exam as 15%."

Grading Scale: As stated in the Student Handbook, letter grades are determined based on the following scale:

A- to A+: 90-100

D- to D+: 60-69

B- to B+: 80-89

F: 0-59

C- to C+: 70-79

Homework/ Classwork Policies:

1. All assignments must be completed by the assigned date. Any long-term projects should be worked on daily so that the task is completed on time and will earn the best grade.
2. One major exam will be given mid-year, which will be cumulative.
3. All assignments should be turned in on the due date during the class period. The maximum score for any late assignments will decrease by 10% for every day late until the grade reaches a maximum score of 50%. Any work not turned in will receive a 0.
4. All work must be legibly written or typed, and grammatically correct.

5. Keep all handouts, homework, returned homework and exams in a binder.
6. Ask questions about any instructions that are not clear.

Classroom Policies:

1. Daily, *prepared* attendance is mandatory. The school's attendance policy will be strictly enforced.
2. You are solely responsible for any material covered or announcements made during your absence.
3. You are expected to treat everyone with respect at all times.
4. Cheating or plagiarism will result in a 0 grade for that assessment, and may result in you and may require you to appear before the honor code committee.
5. During all labs, safety comes first! To ensure that you understand what safe laboratory conduct is, you will be asked to sign a lab safety contract.
6. Finally, you are expected to ask questions about any material that is not clear. Do not worry about a question being too simple. If you don't understand, chances are others don't also (Yes, this is really true).

Everyone in this course is required to take the SAT II Biology Exam. Because you will be taking this exam, there will be no cumulative final exam.

Tentative Schedule:

| Week | Topics | Chapters |
|------|--|---------------|
| 1 | Overview of Biology & Biological Techniques Review: Water & Chemistry of Life | Ch. 1 & Ch. 2 |
| 2 | Molecules of Cells: Carbohydrates, Lipids, Proteins, and Nucleic Acids | Ch. 3 |
| 3 | Prokaryotic & Eukaryotic cells: Membranes & Subcellular organization | Ch. 4 & Ch. 5 |
| 4 | Free energy changes, Coupled reactions & Enzymes | Ch. 5 |
| 5 | Cellular Respiration and Fermentation | Ch. 6 |
| 6 | Photosynthesis | Ch. 7 |
| 7 | Cell Cycle, Meiosis & Gametogenesis | Ch. 8 |

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| 8 | Molecular Biology of the Gene: Structure and Replication of Genetic Material | Ch. 10 |
| 9 | Central Dogma: Transcription and Translation & Microbial Genetics | Ch. 10 |
| 10 | Inheritance Patterns | Ch. 9 |
| 11 | Gene Regulation | Ch. 11 |
| 12 | DNA Technology and Genomics | Ch. 12 |
| 13 | Thanksgiving Break/ Evolution of Microbial Life & Evolution of Plants and Fungi | Ch. 16 & Ch. 17 |
| 14 | Population Evolution | Ch. 13 |
| 15 | Origin of Species and Tracing Evolutionary History | Ch. 14 & Ch. 15 |
| 16 | Unifying Concepts of Animal Structure and Function, Nutrition and Digestion | Ch. 20, Ch. 21 |
| 17-18 | Christmas Break/ Evolution of Invertebrate Diversity& Evolution of Vertebrate Diversity | Ch. 18 & Ch. 19 |
| 19 | Gas Exchange, Circulation | Ch. 22 & Ch. 23 |
| 20 | , The Immune System, & Control of Temperature and Water Balance | Ch. 24, Ch. 25 |
| 21 | Reproduction and Embryonic Development | Ch. 27 |
| 22 | The Endocrine System, Nervous System | Ch. 26, Ch. 28, |
| 23 | Review/ Mid-Year Exams | |

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| 24 | Sensory Systems, Motor Systems | Ch. 29, Ch. 30 |
| 25 | Plant Structure, Reproduction, and Development, Plant Nutrition and Transport | Ch. 31 & Ch. 32 |
| 26 | Control Systems in Plants | Ch. 33 |
| 27 | The Biosphere & Behavioral Adaptations to the Environment | Ch. 34 & Ch. 35 |
| 28 | Population Ecology, Communities and Ecosystems & Conservation Biology | Ch. 36, Ch. 37, & Ch. 38 |
| 29-30 | Spring Break | |
| 31 | Review for SAT 2 | |
| 32 | Review for SAT 2 | |
| 33 | Review for SAT 2 | |
| 34 | Review for SAT 2 | |
| 35 | Review for SAT 2 | |
| 36 | Current Events in Biology | |
| 37 | Current Events in Biology | |
| 38 | Current Events in Biology | |
| 39 | Final Exam Week | |

Honors Biology Outline:

- I. Overview of Biology
- II. The Chemistry of Life
 - i. Elements, Atoms, and Molecules
 - ii. Properties of Water
 - iii. Chemical Reactions
- III. Molecules of Cells
 - i. Introduction to Organic Compounds
 - ii. Carbohydrates
 - iii. Lipids
 - iv. Proteins
 - v. Nucleic Acids
- IV. Eukaryotic and Prokaryotic Cells
 - i. Introduction to the Cell
 - ii. Cell Structure Involved in Manufacturing and Breakdown
 - iii. Energy-Converting Organelles
 - iv. Internal and External Support: Cytoskeleton and Cell Surfaces
 - v. Membrane Structure and Function
- V. Free Energy Changes, Coupled Reactions and Enzymes
 - i. Energy and the Cell
 - ii. How Enzymes Function
- VI. Cellular Respiration and Fermentation
 - i. Introduction to Cellular Respiration
 - ii. Stages of Cellular Respiration and Fermentation
 1. Glycolysis
 2. Citric Acid Cycle
 3. Fermentation
 - iii. Interconnections between Molecular Breakdown and Synthesis

- VII. Photosynthesis
 - i. The Light Reactions
 - ii. The Calvin Cycle
- VIII. Cell Cycle, Meiosis, and Gametogenesis
 - i. Cell Division
 - ii. Eukaryotic Cell Cycle and Mitosis
 - iii. Meiosis and Crossing Over
 - iv. Alterations in Chromosome Number and Structure
- IX. Molecular Biology of the Gene
 - i. Structure of Genetic Material
 - 1. DNA
 - 2. RNA
 - ii. DNA Replication
 - iii. Central Dogma
 - 1. Transcription
 - 2. Translation
 - 3. Mutation
 - iv. Microbial Genetics
- X. Patterns of Inheritance
 - i. Mendelian Genetics
 - ii. Variations on Mendel's Laws
 - iii. The Chromosomal Basis of Inheritance
 - iv. Sex Chromosomes and Sex-Linked Genes
- XI. Gene Regulation
 - i. Control of Gene Expression
 - 1. Effects of Gene Regulation
 - 2. Transcriptional Control
 - 3. RNA processing
 - 4. Translational Control
 - ii. Cloning of Plants and Animals
 - iii. Genetic Basis of Cancer

- XII. DNA Technology and Genomics
 - i. Gene Cloning
 - ii. Genetically Modified Organisms
 - iii. DNA Profiling
 - iv. Genomics
- XIII. Population Evolution
 - i. Darwin's Theory of Evolution
 - ii. Evolution of Populations
 - iii. Mechanisms of Microevolution
- XIV. Origin of Species & History of Evolution
 - i. Concepts of Species
 - ii. Mechanisms of Speciation
 - iii. Early Earth
 - iv. Major Events in the History of Life
 - v. Mechanisms of Macroevolution
 - vi. Phylogeny
- XV. Evolution of Microbial Life
 - i. Prokaryotes
 - ii. Protists
- XVI. Evolution of Plants and Fungi
 - i. Plant Evolution and Diversity
 - ii. Alternations of Generations and Plant Life Cycles
 - iii. Fungi
- XVII. Evolution of Invertebrate Diversity
 - i. Animal Evolution and Diversity
 - ii. Invertebrate Diversity
- XVIII. Evolution of Vertebrate Diversity
 - i. Vertebrate Evolution and diversity
 - ii. Primate Diversity
 - iii. Hominid Evolution

- XIX. Unifying Concepts of Animal Structure and Function
 - i. Hierarchy of Structural Organization in Animals
 - 1. Structure and Function
 - 2. Types of Tissues
 - ii. Exchanges with the External Environment
- XX. Nutrition and Digestion
 - i. Obtaining and Processing Food
 - ii. Human Digestive System
 - iii. Nutrition
- XXI. Gas Exchange
 - i. Mechanisms of Gas Exchange
 - ii. Transport of Gases in the Human Body
- XXII. Circulation
 - i. Mechanisms of Internal Transport
 - ii. Human Cardiovascular System
 - iii. Structure and Function of Blood
- XXIII. Immune System
 - i. Innate Immunity
 - ii. Adaptive/ Acquired Immunity
 - iii. Disorders of the Immune System
- XXIV. Control of Body Temperature and Water Balance
 - i. Thermoregulation
 - ii. Osmoregulation and Excretion
- XXV. Hormones and the Endocrine System
 - i. Chemical Regulation
 - ii. Vertebrate Endocrine System
 - iii. Hormones and Homeostasis
- XXVI. Reproduction and Embryonic Development
 - i. Asexual and Sexual Reproduction
 - ii. Human Reproduction
 - iii. Principles of Embryonic Development

- iv. Human Development
- XXVII. Nervous System
 - i. Nervous System Structure and Function
 - ii. Nerve Signals and Their Transmission
 - iii. Overview of Animal Nervous Systems
 - iv. Human Brain
- XXVIII. The Senses
 - i. Sensory Reception
 - ii. Hearing and Balance
 - iii. Vision
 - iv. Taste and Smell
- XXIX. Movement
 - i. Movement and Locomotion
 - ii. Skeletal Support
 - iii. Muscle Contraction and Movement
- XXX. Plant Structure, Reproduction, and Development
 - i. Plant Structure and Function
 - ii. Plant Growth
 - iii. Reproduction of Flowering Plants
- XXXI. Plant Nutrition and Transport
 - i. The Uptake and Transport of Plant Nutrients
 - ii. Plant Nutrients and the Soil
 - iii. Plant Nutrition and Symbiosis
- XXXII. Control Systems in Plants
 - i. Plant Hormones
 - ii. Growth Responses and Biological Rhythms in Plants
 - iii. Plant Defenses
- XXXIII. The Biosphere
 - i. Aquatic Biomes
 - ii. Terrestrial Biomes

XXXIV. Behavioral Adaptations to the Environment

- i. Study of Behavior
- ii. Learning
- iii. Survival and Reproductive Success
- iv. Social Behavior and Sociobiology

XXXV. Population Ecology

- i. Population Structure and Dynamics
- ii. Human Population

XXXVI. Communities and Ecosystems

- i. Community Structure and Dynamics
- ii. Ecosystem Structure and Dynamics

XXXVII. Conservation Biology

- i. The Biodiversity Crisis
- ii. Conservation Biology and Restoration Ecology