

## **Biology**

### **Textbook:**

BSCS Biology, An Ecological Approach 9<sup>th</sup> ed. 2002. Kendal / Hunt.

### **Prerequisites:**

Acceptance into the Sophomore year at Covington Latin School

### **Course Description:**

This is a course in general biology with ecological interactions as its organizing theme. The course covers the biological basics, ecology, the cell, basic biochemistry, bioenergetics, genetics, evolution, and the three domains of life. The course meets six times a week, with a double period for laboratory work which is heavily stressed.

### **Course Goals:**

1. To develop a basic understanding of science as a process.
2. To understand the continuity of life on earth.
3. To understand evolution as the organizing principle of biology
4. To examine biology's connection to medicine, public health, agriculture, conservation, and other social issues
5. To examine the historical development of biological concepts and how those concepts relate to society and technology

### **Course Objectives:**

1. Students will demonstrate their ability to gather, analyze and present data in formal laboratory exercises.
2. Students will demonstrate knowledge of basic biological process; ie light and dark reactions of photosynthesis.

### **Course Sequence:**

1. Basic Ecology
  - a. Flow of matter and energy
  - b. Producer, Consumer
  - c. Biosphere as a concept
2. Basic Population Biology
  - a. Rates of increase and decrease
  - b. Determining Rates
  - c. Limiting Factors – density
  - d. Carrying capacity
  - e. Lab: Study of a population -- yeast
3. The Ecosystem
  - a. The biotic community and the abiotic environment
  - b. Basic Relationships within the biotic community
  - c. Structure of the ecosystem in space and time
  - d. Energy structure of the ecosystem

- e. Lab: Biomagnification demonstration
- 4. Basic Biochemistry
  - a. Chemistry basics
  - b. Biological molecules
  - c. Labs: Biology and pH
    - i. Rate of enzymatically driven reactions
- 5. The Cell – Eukaryotic
  - a. Cell structure
  - b. Cell transport
  - c. Cell division
  - d. Labs: Observing plant and animal cells
    - i. Observation of plant and animal mitosis
    - ii. Egg osmosis
- 6. Bioenergetics – Photosynthesis
  - a. History
  - b. Light reactions
  - c. Calvin Cycle
  - d. Photorespiration
  - e. C4 and CAM photosynthesis
  - f. Lab: Paper chromatography
- 7. Bioenergetics – Cellular Respiration
  - a. History
  - b. Glycolysis
  - c. Krebs Cycle
  - d. Electron transport and the structure of the mitochondrion
  - e. Fermentation

## **Semester Break**

- 8. Reproduction
  - a. Asexual Reproduction
  - b. Sexual Reproduction
  - c. Meiosis
  - d. Human reproduction
  - e. Lab: Meiosis modeling
- 9. Development
  - a. Life cycles
  - b. Phases of mammalian development
  - c. Human development
- 10. Genetics
  - a. Mendelian inheritance

- b. Non-Mendelian inheritance
- c. Human genetics
- d. Pedigrees
- e. Race for the structure of DNA
- f. DNA as genetic material
- g. DNA replication
- h. Protein synthesis
- i. Labs: Probability and Mendel
  - i. DNA Extraction

#### 11. Evolution

- a. Short history of the idea
- b. Darwin and Natural Selection
- c. Microevolution and speciation
- d. 1920-1970 – The Synthesis
- e. Hardy-Weinberg Equilibrium
- f. Punctuated Equilibrium
- g. Lab: Hardy-Weinberg Goldfish

#### 12. Taxonomy and Systematics

- a. Carolus Linnaeus
  - i. Binomial System
- b. Systematics
  - i. Quick trip through three domains
- c. Origin of Life
- d. Major landmarks in earth's development
- e. Lab: Forming coacervates

#### 13. Prokaryotes and Virus

- a. Basic prokaryotic cell
- b. Archea
- c. Eubacteria
- d. Nitrogen cycle
- e. Bacterial Pathogens
- f. Viruses
  - i. Structure
  - ii. Viral pathogens

#### 14. Protists and Fungi

- a. Origin of the eukaryotic cell
- b. Protists
- c. Fungi
  - i. Basic groups
- d. Lab: Life in a drop of pond water

#### 15. Plants

- a. Origin of plants

- b. Bryophytes
  - c. Ferns and fern allies
  - d. Seed plants
  - e. Flowering plants
  - f. Function of flowers
  - g. Monocots and dicots
  - h. Lab: Flower dissection
16. Animals
- a. Origin of the Animal Kingdom
  - b. Basic animal organization
  - c. Major phyla of the Animal Kingdom

**Evaluation:**

**Projects, presentations, tests, and homework**, will be evaluated on the basis of a point system. Each will be designated a point value according to the length and difficulty of the task. Students will be told the point value of each assignment when it is assigned.

**Exams** are given at the end of the semester and account for 200 points of the semester grade.

**Schoology** is an online tool that students are required to use to access videos, important resources, and assignments. Instructions on how to use Schoology are provided in class. All assignment due dates are posted on the Schoology calendar.

**Nightly homework assignments** will be completed on Schoology or in the students' binder. Any assignment not completed by the due date and time (usually the beginning of class the day that it is due) will be counted late.

**Lab reports and projects** are submitted to Trunitin.com for a grade (usually 100 pts). All lab reports or projects that are not turned in by the deadline are considered to be late and will have ten percent deducted from their final grade for each day that they are late. Not all labs in this class will require the writing of a lab report.

**Supplemental Materials**

Worksheets, videos from [www.unitedstreaming.com](http://www.unitedstreaming.com), Bozeman Science videos, Crash Course videos, animations from various websites including PBS.com, NOVA videos, Dr. Art's Bio-songs, and The Howard Hughes Medical Institute website.

