Biology I and Biology II (BIOL 1450/1750)/AP Biology
Syllabus

This UNO course has been approved by UNO faculty to be offered for dual credit, and this syllabus meets disciplinary outcomes as reflected in UNO’s master syllabus. Students must submit a dual credit application and meet all registration, academic, and other institutional requirements according to established deadlines in order to receive UNO course credit. Please visit dualenroll.unomaha.edu for additional information.

Office hours: Via email
Email: christin.frahmkrick@ops.org
Office phone: NA
Class location/time: Burke High School, Rm 244

Textbook:
Pearson Education AP Biology, AP Test Prep Series, Holtzclaw and Knapp
Holtzclaw [X]

Prerequisite(s): High school biology and chemistry. College-level chemistry recommended. BIOL 1450 is prerequisite for BIOL 1750.

Course Description: AP Biology covers a breadth and depth of general principles of biology consistent with BIOL 1450 (Biology I) and BIOL 1750 (Biology II) at the University of Nebraska at Omaha. Thus, credit for BIOL 1450 will be available in the first half of the course and BIOL 1750 credit will be available in the second half. Biology I (BIOL 1450) concepts covered in this dual enrollment course include the chemical and physical basis of living systems, cell structure and function, energy and metabolism, genetics and molecular genetics, and evolution of biological diversity. Biology II (BIOL 1750) concepts include an introduction to the study of life, concentrating on whole organisms and their interactions with the environment, with a focus on evolution and natural selection, biodiversity, physiologic responses to the environment, organ systems, population dynamics, community ecology, and energy and material flow through ecosystems. The laboratory will provide inquiries into these same topics. These courses are intended as the first course series for Biology majors.

Performance Objectives/Student Learning Outcomes
This course is aligned with UNO disciplinary outcomes as reflected in UNO’s master syllabi. The course is intended to provide biology majors with an appreciation for the breadth of topics that make up the biological sciences, to provide them with the background needed for advanced study in biology, and to introduce them to the process of science as a way of learning about the natural world. The course also introduces students to the professional practices of biologists through laboratory investigations, writing and communication in science, and the reading of biological literature.

Specific learning objectives include:

1. Students will articulate their understanding of evolution as a unifying theory in biology. This will include an understanding of the common descent of diverse organisms and the processes that result in evolutionary change.
2. Students will recognize the hierarchy of organizational levels in biology together with the associated ideas of emergent properties present at each level.
3. Students will describe the chemical and physical properties that underlie the processes in living systems and the properties of major biological molecules.
4. Students will recognize the cell as the fundamental unit of living things, describe functional activities associated with cellular components, and realize how components interact.
5. Students will demonstrate an understanding of energy conversions in cells.
6. Students will describe the employment and transmission of biological information in the form of DNA and the expression and regulation of genes.
7. Students will recognize how genomes evolve and apply the basic principles of evolution to the generation of biological diversity.
8. Students will classify organisms and relate classifications to evolutionary history, and become familiar with the major divisions/phyla of the eukaryotes, including plants, fungi, and animals.
9. Students will recognize the diverse taxa of organisms that inhabit the Earth and how they are related in the tree of life.
10. Students will describe the major advances in organisms during evolutionary history; focusing on the emergence of eukaryotes from prokaryotes, development of sexual reproduction, multicellularity, increasing dominance by the sporophyte generation in plants, adaptations that helped plants and vertebrates move onto land, increasing complexity in body plans, and developmental patterns in animals.
11. Students will demonstrate understanding of the principles of reproduction in plants, animals, and fungi, focusing on conifer and angiosperm seed production in plants, alternation of asexual and sexual reproduction in fungi, and sexual reproduction in animals.
12. Students will describe the evolution and function of vascular systems in plants and organ systems in animals and how these systems provide nutrition, water, and waste removal needed to sustain life.
13. Students will articulate a basic understanding of ecology, including population dynamics, community structure, and patterns of nutrient and energy flow in ecosystems.
14. Students will put into practice the experimental and inquiry based approaches that generate new findings in biology.
15. Students will practice reading, writing, and communicating in biology.

General Education Student Learning Outcomes (Natural and Physical Sciences)
This course also fulfills a UNO General Education requirement and is aligned with the following General Education Student Learning Outcomes (SLOs). After completing the course, successful students shall be able to do the following:

- Demonstrate a broad understanding of the fundamental laws and principles of science and interrelationships among science and technology disciplines;
- Demonstrate a broad understanding of various natural and/or physical phenomena that surround and influence our lives;
- Describe how scientists approach and solve problems including an understanding of the basic components and limitations of the scientific method;
- Solve problems and draw conclusions based on scientific information and models, using critical thinking and qualitative and quantitative analysis of data and concepts in particular to distinguish reality from speculation.

Tier I Writing Requirement
At the University of Nebraska at Omaha, the College of Arts and Sciences requires all students to meet minimum writing requirements. Students working towards the B.S. in Biology, B.A. in Biology, B.S. in Biotechnology, and B.S. in Environmental Studies [Life Sciences Concentration] are expected to satisfy
the College Writing Requirement by completing two courses at each of three tiers in Biology. BIOL 1450 and BIOL 1750 together satisfy the first tier (i.e. Tier I), which states:

1. Students should become familiar with the range of scientific communication and be able to identify features of the primary and secondary (review) literature that distinguish these from popularized or non-scientific sources; and
2. Students should be asked to read from the secondary (review) literature and/or primary literature and compose cogent summaries in response to questions.

Assessment Summary
In general, lecture exams, lecture assignments and lecture quizzes will account for approximately 60% of the final grade and laboratory exams, laboratory assignments and laboratory quizzes will account for approximately 40% of the final grade.

Grading
Your grade in the course is determined by the percentage of total points you earn. A sample grading scale is provided here, but the final grading scale may be adjusted according to class performance.

A = 3.26 – 4.00
B = 2.51 – 3.25
C = 1.76 – 2.50
D = 1.01 – 1.75
F = 0.00 – 1.00

Tentative Schedule

Schedule Appendix  A/B Alternating Block Schedule
Course Layout:
1st Semester

<table>
<thead>
<tr>
<th>Duration (weeks)</th>
<th>Unit</th>
<th>Chapter</th>
<th>Topic of Study</th>
<th>Lab/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Science as a Process</td>
<td>1</td>
<td>Scientific Terms, Concepts and Methods in Biology, Lab Procedures, Writing Lab Reports</td>
<td>Lab: Chi Squared with skittels, CER Lab: OREO</td>
</tr>
</tbody>
</table>


| 2.5 | Ecology | 53-55 | Population Ecology  
Communities and Ecosystems |
|  |  | 52 | Humans and the Environment  
A. Population Dynamics & Limiting Factors  
B. Community Relationships in Ecosystems  
C. Trophic Levels and Energy Transfer  
D. Nutrient Cycles  
E. Human Impact |
|  |  |  | Lab: Population growth simulation  
https://concord.org/stem-resources/african-lions-modeling-populations  
Skills/Goals: analyze population data and carrying capacity  
Lab: Food Webs stations  
Skills/Goals: Understanding food sources of predators. Designing a food web.  
Lab: Prairie visit and inquiry lab on population, communities. |
| 1.5 | Chemistry of Life | 2 | Chemistry Fundamentals  
Carbon Compounds |
|  |  | 4 | Water and its uses |
|  |  |  | Lab: Using Microscopes and observing Cell Structures  
Skills/Goals: Preparing students to use microscopes. Observing structures of plant, animals and fungal cells.  
Lab: Cell Communication (Pathways with Friends)  
Skills/Goals: macroscopically introduce cellular communication  
Lab: Osmosis and Diffusion  
Skills/Goals: Investigating effects of solute concentration on water potential |
| 4 | Cells | 6 | Cell Structure  
- Cell Structure & Function  
  - Prokaryotic Cells  
  - Eukaryotic Cells  
Cell Membranes |
|  |  | 7 | Website: http://www.cellsalive.com/  
Cell Structure Unit Test |
|  |  |  | Biochemistry Unit Test |
| 3 | Cellular Energetics | 10 |  Video: Photosynthesis: Life and Energy, NGS (Washington D.C.)  
| 9 | Video: Cell Respiration, FHS (Princeton, NJ) |  |  A. Introduction to Metabolism  
|   |   |   | B. Enzymes  
|   |   |   | C. Autotrophic Nutrition & Primary Productivity  
|   |   |   | • Chemosynthesis  
|   |   |   | • Photosynthesis  
|   |   |   | D. Cell Respiration & Nutrient Digestion  
|   |   |   | Lab: Plant Pigment and Photosynthesis  
|   |   |   | Skills/Goals: Plant chromatography and use of spectrometer to determine rate of light dependent reactions.  
|   |   |   | Lab: Leaf Disk  
|   |   |   | Lab: Cellular Respiration  
|   |   |   | Energy Unit Test  
|   |   |   | Lab: Mitosis Slide Comparison & Chi-Square  
|   |   |   | Lab: Fruit Fly Genetics & Chi-square online simulation  
|   |   |   | Lab: Transformation  
| 4 | Heredity | 12 |  Cell Growth & Regulation  
| 13 |   |   | - Overview of Cell Cycle  
|   |   |   | - Mitosis & Cell Division  
|   |   |   | - Regulation of the Cell Cycle  
|   |   |   | **Lab: Mitosis Slide Comparison & Chi-Square  
|   |   |   | B. Heredity: Continuity of Life  
|   |   |   | - Meiosis  
|   |   |   |   | o Life Cycle Diagrams for Fungi, Plants, & Animals  
|   |   |   | - Mendelian Patterns of Inheritance  
|   |   |   | - Other Patterns of Inheritance  
|   |   |   | - Special Mechanisms of Inheritance  
|   |   |   |   | o Cytoplasmic inheritance  
|   |   |   |   | o Mitochondrial DNA  
|   |   |   | **Lab: Fruit Fly Genetics & Chi-square online simulation  
|   |   |   | Activity: Mitosis/Meiosis  
|   |   |   | Skills/Goals: Show the processes of cellular replication and gametic formation on the chromosomal level.  
|   |   |   | Lab: Wisconsin Fast Plant 72 hour artificial selection lab from Carolina  
|   |   |   | Heredity Unit test  
| 1 |   |   | Review for Final  
|   |   |   | Semester 1 Final Exam  
|   |   |   |   |
### Course Layout: 2nd Semester

<table>
<thead>
<tr>
<th>Duration (weeks)</th>
<th>Unit</th>
<th>Chapter</th>
<th>Topic of Study</th>
<th>Lab/Activities</th>
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<tbody>
<tr>
<td>4</td>
<td>Molecular Genetics</td>
<td>14-15</td>
<td>Patterns of Genetic DNA/Protein Synthesis</td>
<td><strong>Lab: Gel Electrophoresis Simulation</strong>&lt;br&gt;Gene Regulation &amp; Development&lt;br&gt;- Prokaryotic Gene Regulation&lt;br&gt;- Eukaryotic Gene Regulation</td>
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<td>16-18</td>
<td>- Heritable Material</td>
<td><strong>Lab: Genetics (Chi Square)</strong>&lt;br&gt;Skills/Goals: Growth of Fast plants to observe effects of cross breeding bean plants and analysis of results with Chi-square. Simulation: Geniverse if time permits</td>
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<td>- DNA Structure &amp; Replication</td>
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<td>- The Genetic Code: Transmitting &amp; Expressing Genetic Information</td>
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<td>▪ Central Dogma (DNA→RNA→Protein)</td>
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<td>▪ Protein Synthesis</td>
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<td>- Mutations</td>
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<td><strong>Lab: Artifical Selection, BLAST, Hardy-Weinberg</strong></td>
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<td>5</td>
<td>Evolutionary Biology</td>
<td>22-23</td>
<td>Biological Evolution</td>
<td><strong>Lab: Population Genetics (Hardy-Weinberg)</strong>&lt;br&gt;Skills/Goals: Simulating of a mating population to understand the principles of H-W law.</td>
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<td>24</td>
<td>- RNA world</td>
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<td>25</td>
<td>Microevolution and Speciation</td>
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<td>Macroevolution</td>
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<td>Genetic Variation in Populations &amp; the Evolution of Biodiversity</td>
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<td></td>
<td>- Brief overview of Domains and Kingdoms</td>
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<td>- Darwin &amp; the Theory of Natural Selection</td>
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<td>▪ Evidence of Evolution</td>
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<td>▪ Establishing Evolutionary Relationships</td>
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<td>▪ Bioinformatics &amp; Cladistics</td>
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<td>- Evolution of Populations</td>
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<td>- Speciation</td>
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<td><strong>Labs: Artificial Selection, BLAST, Hardy-Weinberg</strong></td>
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<td>3</td>
<td>Biodiversity</td>
<td>19, 27</td>
<td>Prokaryotes and Viruses</td>
<td><strong>Lab: Origin of Life</strong>&lt;br&gt;Skills/Goals: Examines chemical interaction to from new compounds that could create life.</td>
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<td>28</td>
<td>Protists</td>
<td>Activity: Using Dichotomous Keys&lt;br&gt;Skills/Goals: To learn to read and manipulate keys and to understand the different vocabulary needed for the keys.</td>
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<td>31</td>
<td>Fungi</td>
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<td>29-30</td>
<td>Plants</td>
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<td>32</td>
<td>Animals</td>
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Establishing Evolutionary Relationships
- Bioinformatics & Cladistics
- Evolution of Populations
- Speciation

Biodiversity Unit Test

| Function/Structure Animals | 40 | 48-50 | 47 | Exchange of Materials with the Environment & Their Transport
| | | | | - Cell Membrane Structure & Transport
| | | | | - Human Circulatory System
| | | | | - Interaction & Coordination with the Respiratory System
| | | | | - Interaction & Coordination with the Digestive System
| | | | | - Osmoregulation & Excretion
| | | | | B. Responding to the Environment
| | | | | - Cell Communication & Signaling
| **Lab: Yeast population growth; Yeast communication (Carolina Kit)**
| | | | | - Homeostasis & Feedback Mechanisms
| | | | | - Endocrine System (long distance signaling)
| | | 43 | Nervous System (short distance signaling)
| | | | | *Animal Behavior
| | | | | - Plant Responses
| | | | | - Defense Against Pathogens
| | | | | - Immune System
| | | | | - Viruses & Replication
| | | | | Plant Defenses
| | | | | Practice Free Response for AP Exam

Lab: Physiology of Circulatory System
Skills/Goals:
- Investigating effects of blood pressure, pulse rate and effects of temperature on heart rate of Daphnia

| Ecology | 51 | Animal Behavior

Lab: Animal Behavior
Skills/Goals: Collecting observations of pillbug behavior environmental variables, or equivalent.

Note: This course layout is subject to change. I may add review/study sessions for extra learning opportunities. Also, labs may be added or supplemented with others due to possible
time constraints we may face. In addition, due to the same time constraints we may face, field trips and extra activities that are planned may have to be cancelled to make sure that you are adequately prepared to take and pass the AP Exam; date of the exam is yet to be determined. This is what we are ultimately working for!!

Final Exam: AP Exam May 11, 2020

Disability services: Appropriate accommodations for students with disabilities are the responsibility of the host institution.

Academic Integrity: “The maintenance of academic honesty and integrity is a vital concern of the University community. Any student found responsible for violating the policy on Academic Integrity shall be subject to both academic and disciplinary sanctions.”