Course Overview
The course is designed around the AP Biology Curriculum Framework that focuses on the major concepts in biology and their connections. This Framework allows students to develop a good understanding of specific concepts within college-based Biology, as well as experience application of those concepts within an Inquiry-based setting, without strict reliance upon a textbook. AP Biology will meet within the parameters of the A/B alternating block schedule. Students will be enrolled in AP Biology for two semesters. The block will give us the freedom to use a variety of instructional techniques and incorporate both discussion and lab within the same block, if appropriate.

AP Biology Big Ideas
- **Big Idea 1**: The process of evolution drives the diversity and unity of life
- **Big Idea 2**: Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis.
- **Big Idea 3**: Living systems store, retrieve, transmit and respond to information essential to life processes.
- **Big Idea 4**: Biological systems interact, and these systems and their interactions possess complex properties.

Textbooks/Resources
  - This website is provided by the Prentice Hall Publisher and provides students with pre- and post-lab reviews. Animations and interactive questions connect the laboratory procedures to biological principles.

Course Detail
Advanced Placement Biology is designed to be the equivalent of a two semester college introductory biology course. This class will be conducted on a college level; therefore students will be expected to work to that level. Students taking AP Biology have already completed a high school biology course. However, AP biology differs significantly from this prior course due to the content of the text, depth of the material covered, lab work, in addition to the time/effort required to be successful and achieve mastery of the subject.

Every lesson has a foundation within each of the Big Ideas presented with AP Biology Curriculum Framework. Although each Big Idea is listed separately, each is dependent on the others. In order to understand the extensive concepts in this course, we will be studying in depth each of these themes, how they are connected to each other, and how they are integrated into every area of Biology that we will be studying. You will quickly see that concepts in Biology are not mutually exclusive, but linked with many others.

Inquiry Component
AP Biology is instituting a change to an Inquiry-based curriculum. Laboratory experiences are a vital component of this shift, as it allows application of concepts learned from the Big Ideas. Each Big Idea will have a minimum of 2 Laboratory experiences to enhance student learning. Students will be responsible for:
- **Formal lab report** that emphasizes the development and testing of a hypothesis, the ability to organize collected data, and the ability to analyze and clearly discuss the results.
- **Formal presentations** detailing finding from Inquiry activities.
Self-assessments of their ability to work in group investigations that will often be conducted in teams of 2 or 3 in order for students to develop group skills and learn the importance of collaboration among scientists.

**Laboratory Investigations for this course**
- Artificial Selection Lab
- Restriction Enzyme and analysis Lab
- Population Genetics and Evolution Lab
- Animal Behavior Lab
- Plant Pigments and Photosynthesis Lab
  - Transpiration Lab
  - BLAST Lab
  - Cell Communication Lab
  - Bacterial Transformation Lab
  - Cell Respiration Lab
  - Enzyme activity Lab
  - Diffusion and Osmosis Lab

**Course Objectives:**

A. Lab Work relies heavily on the use of both inductive and deductive reasoning and emphasizes that science is more than the accumulation of facts but the ability to use those facts in solving problems. As such, we will be devoting approximately 40% of scheduled class time, to Inquiry-based Lab problems.

B. The presentation of the scientific knowledge in each area is enhanced by pointing out the evidence of the evolutionary connections: 1. As a mechanism for population change, 2. As a connection between all cells through similarities in the biochemistry of cells and how small changes in the chemicals could have occurred, 3. As the universality of DNA, or 4. Phylogenetic changes to produce organisms through slow advancing development in complexity.

C. The presentation of scientific knowledge requires a continued reference to the 1. need for energy to do all of life processes; 2. correlation between the structure of an organelle, cell, organ, tissue, system and what it does functionally for the organism; and 3. the need for balance to maintain the living condition in a homeostatic state through coordination and regulation.

D. Systematic studies incorporate species maintenance as well as the dependence of all organisms on each other.

E. The study of biology has always incorporated current societal concerns and the development of technology in scientific research – cloning, stem cell research, organ donation, use of DNA data, - as well as environmental issues (global warming, population management, pollution, habitat destruction), etc. help students to become better prepared to evaluate social problems. Having a class at the high school level enables us to discuss social concerns as they come up in a topic, as the result of a newspaper article, a story seen on TV or any source that triggers the curiosity of a student. In this class we remain flexible enough to talk about, discuss and debate any of these topics that students are interested in discussing.

**Course Schedule**
Grading (% of Grade)
- **Tests/Quizzes (~50%)** Students will be required to take chapter quizzes and unit tests. These tests will incorporate various types of questions from previous AP Biology exams.
- **Labs (~40%)** Lab work will be a significant part of this course. The labs we conduct will be Inquiry-based (hands-on) and focused around the Big Ideas from the AP Biology Framework. Lab reports will be required and will be used as a source of information for quizzes and tests.
- **Projects/Papers (~10%)** Completion of a project or paper will be required to complete the final component of this course.

Attendance:
It is absolutely critical that you are not absent unless you absolutely have to be. Because we are conducting this class in a block format, if you miss an entire 80-minute class, you are in essence missing two-day’s worth of material. If you do miss class, you will be responsible for any information covered or lab work done that day. Make sure that you get notes from another student. If you miss a lab, make sure that you talk to me about a time that you can make it up after school.

Tests, quizzes, and labs will all be scheduled in advance. If you know that you are going to miss one of these items, talk to me and see if you can make these up before leaving.

Good Web Links:
2. [http://chemistry.about.com/od/chemistrydemonstrations/ss/bluebottle.htm](http://chemistry.about.com/od/chemistrydemonstrations/ss/bluebottle.htm)
### 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</td>
<td>Lab: Chi Squared with skittles</td>
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<td>Concepts and Methods in Biology</td>
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<td>Lab Procedures</td>
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<td>Writing Lab Reports</td>
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<td></td>
<td></td>
<td>52</td>
<td>Communities and Ecosystems</td>
<td><a href="https://concord.org/stem-resources/african-lions-modeling-populations">https://concord.org/stem-resources/african-lions-modeling-populations</a></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Humans and the Environment</td>
<td><em>Skills/Goals: analyze population data and carrying capacity</em></td>
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<td></td>
<td>A. Population Dynamics &amp; Limiting Factors</td>
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<td>B. Community Relationships in Ecosystems</td>
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<td>C. Trophic Levels and Energy Transfer</td>
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<td>D. Nutrient Cycles</td>
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<td>E. Human Impact</td>
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<tr>
<td>1</td>
<td>Chemistry of Life</td>
<td>2</td>
<td>Chemistry Fundamentals</td>
<td>Lab: Owl Pellets and Food Webs</td>
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<td>4</td>
<td>Carbon Compounds</td>
<td><em>Skills/Goals: Understanding food sources of barn owls.</em></td>
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<td>3</td>
<td>Water and its uses</td>
<td><em>Designing a food web.</em></td>
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<td>Lab: Prairie visit and inquiry lab on population, communities.</td>
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<td>6</td>
<td>Cell Structure</td>
<td>Lab: Using Microscopes and Observing Cell Structures</td>
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<td>o Cell Structure &amp; Function</td>
<td><em>Skills/Goals: Preparing students to use microscopes.</em></td>
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<td></td>
<td>• Prokaryotic Cells</td>
<td><em>Observing structures of plant, animals and fungal cells.</em></td>
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<td></td>
<td>• Eukaryotic Cells</td>
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<td>7</td>
<td>Cell Membranes</td>
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<td>Lab: Cell</td>
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<tr>
<td></td>
<td>Biochemistry Unit Test</td>
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</tbody>
</table>
Skills/Goals: Plant chromatography and use of spectrometer to determine rate of light dependent reactions.  
Lab: Leaf Disk  
Lab: Cellular Respiration  
|---|---|---|---|---|
| 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 | |

| 4 | Evolutionary Biology | 22-23 | - Biological Evolution  
  o RNA world  
  Microevolution and Speciation  
  Macroevolution  
  Genetic Variation in Populations & the Evolution of Biodiversity  
  - Brief overview of Domains and Kingdoms  
  - Darwin & the Theory of Natural Selection  
    o Evidence of Evolution  
    o Establishing Evolutionary Relationships  
    ▪ Bioinformatics & Cladistics  
  - Evolution of Populations  
  - Speciation | Lab: Population Genetics (Hardy-Weinberg)  
Skills/Goals: Simulating of a mating population to understand the principles of H-W law.  
Labs: Artificial Selection (set up 9/22), BLAST, Hardy-Weinberg |
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</thead>
<tbody>
<tr>
<td>24</td>
<td></td>
<td></td>
<td>Evolution Unit Test</td>
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<td>25</td>
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</tbody>
</table>

| 2 | Biodiversity | 19, 27 | Prokaryotes and Viruses  
Protists | Lab: Origin of Life  
Skills/Goals:  
Activity: Using Dichotomous Keys  
Skills/Goals: To learn to read and manipulate keys and to understand the different vocabulary needed for the keys. |
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<tbody>
<tr>
<td>28</td>
<td></td>
<td></td>
<td>Fungi</td>
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</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td>Plants</td>
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<tr>
<td>29-30</td>
<td></td>
<td></td>
<td>Animals</td>
<td></td>
</tr>
</tbody>
</table>
| 32 | | | Genetic Variation in Populations & the Evolution of Biodiversity  
  - Brief overview of Domains and Kingdoms  
  - Darwin & the Theory of Natural Selection  
    o Evidence of Evolution  
    o Establishing Evolutionary Relationships  
    ▪ Bioinformatics & Cladistics  
  - Evolution of Populations  
  - Speciation |
## 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>
</tr>
</thead>
</table>
| 1                | Ecology               | 51      | Animal Behavior                                    | **Lab**: Animal Behavior  
**Skills/Goals**: Collecting observations of pillbug behavior environmental variables. |
| 4                | Heredity              | 12-13   | Cell Growth & Regulation  
- Overview of Cell Cycle  
- Mitosis & Cell Division  
- Regulation of the Cell Cycle  
**Lab**: Mitosis Slide Comparison & Chi-Square  
B. Heredity: Continuity of Life  
- Meiosis  
  - Life Cycle Diagrams for Fungi, Plants, & Animals  
  - Mendelian Patterns of Inheritance  
  - Other Patterns of Inheritance  
  - Special Mechanisms of Inheritance  
    - Cytoplasmic inheritance  
    - Mitochondrial DNA  
**Lab**: Fruit Fly Genetics & Chi-square online simulation  
*Test*: week of 4/27  
C. Advances in Molecular Genetics  
- Genetically Modified Organisms (Biotechnology Review)  
- Applications & Issues in Molecular Genetics (Bioethics)  
**Lab**: Transformation |
| 3                | Molecular Genetics    | 14-15   | Patterns of Genetic DNA/Protein Synthesis  
- Heritable Material  
  - DNA Structure & Replication  
  - The Genetic Code: Transmitting & Expressing Genetic Information  
    - Central Dogma (DNA→RNA→Protein)  
    - Protein Synthesis  
    - Mutations  
**Lab**: Gel Electrophoresis Simulation (GGC 1/14)  
- Gene Regulation & Development  
  - Prokaryotic Gene Regulation  
  - Eukaryotic Gene Regulation  
**Lab**: Genetics (Chi Square)  
**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 |
| 2                | Function/Structure Plants | 35-36   | Tissues and Transportation                        | **Lab**: Transpiration  
**Skills/Goals**: Students investigate water movement within a plant and measure transpiration |
<table>
<thead>
<tr>
<th>Schedule</th>
<th>Activity</th>
<th>Skills/Goals</th>
</tr>
</thead>
</table>
| 38       | Reproduction, Growth and Development | under different environmental conditions. **Activity:** Observing Flowers  
**Skills/Goals:** Observing and identifying the structures of compound, single and imperfect flowers. |

**Plants Unit Test**

<table>
<thead>
<tr>
<th>40</th>
<th>Exchange of Materials with the Environment &amp; Their Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>- Cell Membrane Structure &amp; Transport</td>
</tr>
<tr>
<td>42</td>
<td>- Human Circulatory System</td>
</tr>
<tr>
<td>43</td>
<td>- Interaction &amp; Coordination with the Respiratory System</td>
</tr>
<tr>
<td>41</td>
<td>- Interaction &amp; Coordination with the Digestive System</td>
</tr>
<tr>
<td>42</td>
<td>- Osmoregulation &amp; Excretion</td>
</tr>
</tbody>
</table>

**B. Responding to the Environment**

- Cell Communication & Signaling
  - **Lab:** Yeast population growth; Yeast communication (Carolina Kit)
  - Human Circulatory System (long distance signaling)
  - Endocrine System (short distance signaling)

**Test:** week of 2/23

**Test:** week of 3/16

- Animal Behavior
- Plant Responses
- Defense Against Pathogens
  - Immune System
    - Viruses & Replication
- Plant Defenses

**Lab:** Physiology of Circulatory System

**Skills/Goals:** Investigating effects of blood pressure, pulse rate and effects of temperature on heart rate of Daphnia

<table>
<thead>
<tr>
<th>2</th>
<th>Test prep/practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Animal Structures and Functions Unit Test</td>
</tr>
<tr>
<td></td>
<td>Prepare for AP Biology Exam</td>
</tr>
</tbody>
</table>

**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, do 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!!