

## **Equinox Program**

**Course Title:** Advanced Placement Biology

### **Course Description**

How do stem cells differentiate into a diverse range of cell types? How do antibiotic-resistant bacteria develop? In Advanced Placement Biology, coursework is centered on three general areas: molecules and cells; heredity and evolution; and organisms and populations. Students develop a framework for understanding modern biology and engage the scientific process through lab experiments, readings, lecture, and discussion. Advanced Placement Biology is designed to be the equivalent of an introductory, college-level biology course focusing on the 8 major themes of biology: science as a process; evolution; energy transfer; continuity and change; relationship of structure to function; regulation; interdependence in nature; science, technology, and society.

### **Essential Questions**

- How do structural levels from molecules to complex organisms ensure the successful function in all living organisms and systems?
- How does the process of evolution account for the biological change of organisms and the biological diversity of life on earth?
- How does scientific research lead to technological advances that can have both positive and negative impacts on society as a whole?

### **Outcomes**

Upon successful completion of this course, students will:

- Know how life functions from the smallest atoms and molecules to large complex ecological systems.
- Understand the inner-workings of our cells including: chemical reactions, the transmission of genetic information and the technologies available to manipulate DNA.
- Understand the different theories of evolution and how scientists infer evolutionary relationships. Students will understand the diversity of living organisms.
- Be able to connect form and function in living things.
- Understand experimental design and how data is used to form scientific knowledge.

### **Instructional Strategies**

For the AP Biology student to be successful in understanding and retaining course information multiple instructional strategies will be used. The most comprehensive instructional strategy used is that of lab work. Lab work illustrates and reinforces lecture concepts and encourages inquiry based thinking. Other instructional strategies utilized include concept modeling, group discussions, statistical analysis, and small group work.

Along with varying instruction strategies, flexible grouping, tiered assignments, and independent study techniques will be utilized to differentiate instruction to help meet the varied level of student abilities.

### **Resources and Materials**

- **Books**

- a. Mader, Sylvia. Biology, 10<sup>th</sup> edition (2010), ISBN-10: 0077274334
- b. AP Biology Lab Manual, AP Central, College Board

• **Other Media**

- a. Mader Biology Lecture Notes Packet

• **Materials**

- a. Scientific calculator (provided by student)
- b. Colored pencils (provided by student)

**Student Assessment**

• **Pre-Assessment**

Selection of multiple-choice questions for the 2008 AP Biology Exam administered by the College Board.

• **CTD Grading Scale**

A+	100-97%	A	96-93%	A-	92-90%
B+	89-87%	B	86-83%	B-	82-80%
C+	79-77%	C	76-73%	C-	72-70%
D+	69-67%	D	66-63%	D-	62-60%
F	below 60%				

• **Breakdown of Final Grade**

The final grade will be based on total points accumulated. Points will be given for the following:

- Daily Quizzes 20 points each
- Practice AP Essays 20 points each
- AP Labs 50 points each
- Midterm / Final 300 points each
- Participation 100 points

• **Post-Assessment**

Selection of multiple-choice questions for the 2008 AP Biology Exam administered by the College Board.

**Schedule**

Date	Topics	In-class Activities	Assignments and Assessments
Monday  <u>Pre-test</u>  <u>Chemistry of Life</u> <i>Chapters 1 – 3</i>	<u>Chemistry of Life</u> <ul style="list-style-type: none"> <li>• Scientific method</li> <li>• Water</li> <li>• Organic molecules</li> </ul>	<u>Activities</u> <ul style="list-style-type: none"> <li>• Properties of water: capillary action, cohesion</li> <li>• Pre-test</li> </ul> <u>LAB</u> <ul style="list-style-type: none"> <li>• AP Lab 1: Osmosis and Diffusion</li> <li>• Set-up design drosophila lab</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>• Completion of lab</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>• Read AP Lab 2: Enzyme Catalysis</li> <li>• Cell Part Chart</li> <li>• Macromolecule Chart</li> <li>• Read: Chapters 4-6</li> </ul>
Tuesday  <u>Enzymes and Cytology</u> <i>Chapters 4 – 6</i>	<u>Enzymes and Cytology</u> <ul style="list-style-type: none"> <li>• Enzymes and substrates</li> <li>• Enzyme action</li> <li>• Protein structure and function</li> <li>• Cells, tissues, and organs</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>• Chapters 1 – 3</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>• Toothpick enzyme demo</li> </ul> <u>LAB:</u> <ul style="list-style-type: none"> <li>• AP Lab 2: Enzyme</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>• Completion of lab</li> <li>• Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>• Complete AP Lab 1: Osmosis and Diffusion</li> <li>• Read: Chapters 7 – 8</li> </ul>

Date	Topics	In-class Activities	Assignments and Assessments
	<ul style="list-style-type: none"> <li>Light and electron microscope</li> <li>Size in cell biology</li> <li>Prokaryotic and eukaryotic cells</li> <li>Cell Theory</li> <li>Membrane structure and proteins</li> <li>Transport across membranes</li> </ul>	<ul style="list-style-type: none"> <li>Catalysis</li> <li>Comparison of animal and plant cells with light microscope</li> </ul>	<ul style="list-style-type: none"> <li>Read AP Lab 4: Plant Pigments and Photosynthesis</li> <li>Read AP Lab 5: Cellular Respiration</li> <li>Practice AP Essay #1</li> </ul>
<p>Wednesday</p> <p><u>Photosynthesis &amp; Respiration</u> <i>Chapters 7 – 8</i></p>	<p><u>Photosynthesis &amp; Respiration</u></p> <ul style="list-style-type: none"> <li>Light and photosynthesis</li> <li>Light-dependent reactions</li> <li>Light-independent reactions</li> <li>Chloroplasts</li> <li>Limiting factors</li> <li>Glycolysis</li> <li>Krebs Cycle</li> <li>Oxidative phosphorylation</li> <li>Mitochondria</li> </ul>	<p><u>Daily Quiz</u></p> <ul style="list-style-type: none"> <li>Chapters 4 – 6</li> </ul> <p><u>Activities</u></p> <ul style="list-style-type: none"> <li>Discussion of the evolutionary implications of chlorophyll (Why chlorophyll? Why green?)</li> <li>Discussion of the similarities between cellular respiration and photosynthesis</li> </ul> <p><u>LAB</u></p> <ul style="list-style-type: none"> <li>AP Lab 4: Plant Pigments and Photosynthesis</li> <li>AP Lab 5: Cellular Respiration</li> </ul>	<p><u>Assessment</u></p> <ul style="list-style-type: none"> <li>Annotated notes</li> <li>Daily quiz</li> </ul> <p><u>Homework</u></p> <ul style="list-style-type: none"> <li>Read: Chapters 9 – 11</li> <li>Read AP Lab 5: Cellular Respiration</li> <li>Read AP Lab 6A: Bacterial Transformation</li> <li>Read AP Lab 6B: DNA Fingerprinting</li> <li>Read AP Lab 3: Meiosis and Mitosis</li> </ul>
<p>Thursday</p> <p><u>Cell Division</u> <i>Chapters 9 – 10</i></p> <p><u>Heredity</u> <i>Chapters 11</i></p>	<p><u>Cell Division and Heredity</u></p> <ul style="list-style-type: none"> <li>Mitosis</li> <li>Meiosis</li> <li>Mendel's Law's of Segregation and Independent Assortment</li> <li>Genes and chromosomes</li> <li>Mendelian inheritance</li> <li>Dihybrid cross</li> <li>Polygenic inheritance</li> <li>Inheritance of blood groups</li> <li>Crossing over</li> <li>Gene linkage and recombination</li> <li>Pedigree analysis</li> <li>Gender</li> </ul>	<p><u>Daily Quizzes</u></p> <ul style="list-style-type: none"> <li>Chapters 7 – 8</li> </ul> <p><u>Activities</u></p> <ul style="list-style-type: none"> <li>Discuss the mitotic cycle's applications to cancer research</li> <li>Chi-square analysis with M&amp;M's</li> <li>Discussion of the ethical issues that surround genetic screening</li> </ul> <p><u>LABS</u></p> <ul style="list-style-type: none"> <li>AP Lab 3: Meiosis and Mitosis</li> <li>AP Lab 6 A: Bacterial Transformation</li> <li>DNA structure model</li> <li>Gel electrophoresis</li> </ul>	<p><u>Assessment</u></p> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Daily quizzes</li> <li>Midterm exam and final</li> </ul> <p><u>Homework</u></p> <ul style="list-style-type: none"> <li>Read: Chapters 12-14</li> <li>Practice AP Essay #2</li> <li>AP Lab 3: Meiosis and Mitosis</li> </ul>
<p>Friday</p> <p><u>Molecular Genetics</u> <i>Chapters 12 – 14</i></p>	<p><u>Molecular Genetics</u></p> <ul style="list-style-type: none"> <li>DNA structure and replication</li> <li>DNA in prokaryotes and eukaryotes</li> <li>Gene expression</li> <li>Transcription and</li> </ul>	<p><u>Daily Quiz</u></p> <ul style="list-style-type: none"> <li>Chapters 9-11</li> </ul> <p><u>Activities</u></p> <ul style="list-style-type: none"> <li>Discussion on the impacts and ethics of genetic technology, ie.: designer</li> </ul>	<p><u>Assessment</u></p> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Daily quiz</li> </ul> <p><u>Homework</u></p> <ul style="list-style-type: none"> <li>AP Lab 7: Drosophila Statistics</li> </ul>

Date	Topics	In-class Activities	Assignments and Assessments
	<ul style="list-style-type: none"> <li>reverse transcription</li> <li>Genetic code</li> <li>Polypeptide elongation</li> <li>Starting and stopping translation</li> <li>Protein structure and function</li> </ul>	babies, employment screenings, insurance coverage, cloning, etc.  <u>LABS</u> <ul style="list-style-type: none"> <li>Lab 6 B: DNA Fingerprinting</li> <li>Lab 7: Statistics of Drosophila</li> <li>Collect data for lab 6</li> </ul>	<ul style="list-style-type: none"> <li>Read: Chapters 43-47</li> <li>AP Lab 6: Bacterial Transformation</li> <li>Read AP Lab 11: Animal Behavior</li> <li>Read AP Lab 12: Dissolved Oxygen</li> </ul>
Monday  <u>Ecology</u> <i>Chapters 43 – 47</i>	<u>Ecology</u> <ul style="list-style-type: none"> <li>Population demographics and growth models</li> <li>Community development and biodiversity</li> <li>Energy flow in ecosystems</li> <li>Terrestrial and aquatic ecosystems</li> <li>Conservation</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>Chapters 12-14</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>Discussion of ecology as a process – unique situations with constantly changing ecosystems that require individualized approaches</li> <li>Discussion of environmental concerns: global warming, population explosions, habitat destruction, endangered species, etc.</li> <li>Group Project: Annotated Ecology Booklets</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>AP Lab 11: Animal Behavior</li> <li>AP Lab 12: Dissolved Oxygen and Aquatic Primary Productivity, pt 1</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>AP Lab 11: Animal Behavior</li> <li>Annotated Ecology Booklet</li> <li>Read AP Lab 8: Population Genetics</li> <li>Read: Chapters 15-17, 30</li> </ul>
Tuesday  <u>Evolution</u> <i>Chapters 15 – 17, 30</i>	<u>Evolution</u> <ul style="list-style-type: none"> <li>Theories of evolution</li> <li>Evidence of evolution</li> <li>Population genetics (including Hardy-Weinberg Equilibrium)</li> <li>Mutations and polymorphisms</li> <li>Species and speciation</li> <li>Human origins</li> <li>Human evolution</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>Chapters 43-47</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>Discussion of antibiotic resistance in bacteria and pesticide resistance in insect populations</li> </ul> <u>Video</u> <ul style="list-style-type: none"> <li>Judgment Day: Intelligent Design on Trial</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>AP Lab 6A &amp; B Bacterial Transformation and DNA Fingerprinting</li> <li>Read: Chapters 19-22</li> <li>Read AP Lab 8: Population Genetics</li> <li>Complete Video Q's packet</li> <li>Practice AP Essay #4</li> </ul>
Wednesday  <u>Systematics</u> <i>Chapters 19</i>  <u>Microbiology and Evolution</u> <i>Chapters 20 – 22</i>	<u>Taxonomy</u> <ul style="list-style-type: none"> <li>Prokaryotes</li> <li>Protists</li> <li>Fungi</li> <li>Plants</li> </ul> <u>Systematics</u> <ul style="list-style-type: none"> <li>Cladograms</li> </ul>	<u>Activities</u> <ul style="list-style-type: none"> <li>Discussion of theoretical necessities of a unifying classification systems</li> <li>Cladograms</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>AP Lab 12: Dissolved</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Midterm Exam!</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>AP Lab 12: Dissolve Oxygen and Aquatic Primary Productivity</li> </ul>

Date	Topics	In-class Activities	Assignments and Assessments
<u>Midterm Exam</u> Chapters 1-22, 43-47	<ul style="list-style-type: none"> <li>Phylogeny</li> </ul>	Oxygen and Aquatic Primary Productivity, pt. 2 <ul style="list-style-type: none"> <li>AP Lab 8: Population Genetics</li> </ul>	<ul style="list-style-type: none"> <li>AP Lab 8: Population Genetics</li> <li>Read AP Lab 9: Transpiration</li> <li>Read: Chapters 23-27</li> <li>AP Practice Essay #4</li> </ul>
Thursday  <u>Plant Evolution and Biology</u> <i>Chapters 23 – 27</i>	<u>Plants</u> <ul style="list-style-type: none"> <li>Structure an growth</li> <li>Bryophytes, Pterophytes, gymnosperms, angiosperms</li> <li>Monocots and dicots</li> <li>Transport in plants</li> <li>Plant nutrition</li> <li>Plant reproduction and development</li> <li>Control systems in plants</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>Chapters 19-22</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>Outside “Parade of Plants”</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>AP Lab 9: Transpiration</li> <li>Comparison of monocots and dicots</li> <li>Flower dissection</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>Complete “Parade of Plants” packet</li> <li>AP Lab 9: Transpiration</li> <li>Pre- read squid dissection guide</li> <li>Read: Chapters 28-30</li> </ul>
Friday  <u>Animal Evolution and Diversity</u> <i>Chapters 28 – 30</i>	<u>Taxonomy</u> <ul style="list-style-type: none"> <li>Animals</li> <li>Invertebrates</li> <li>Vertebrates</li> <li>Jawless vertebrates</li> <li>Fishes</li> <li>Tetrapods</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>Chapters 23-27</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>“Parade of Kingdoms”</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>Identification of protists</li> <li>Mushroom dissection</li> <li>Comparison of sponge and hydra</li> <li>Squid dissection</li> </ul>	<u>Assessment</u> Completion of lab Daily quiz  <u>Homework</u> <ul style="list-style-type: none"> <li>Complete “Parade of Kingdoms” packet</li> <li>Practice AP Essay 5</li> <li>Read: Chapters 31-34</li> </ul>
Monday  <u>Structure and Function of Animals / Human Physiology, part 1</u> <i>Chapters 31 – 34</i>	<u>Human Body Systems</u> <ul style="list-style-type: none"> <li>Levels of structure and organization</li> <li>Body plans</li> <li>Regulating the internal environment</li> <li>Circulation and gas exchange</li> <li>Defenses against infection</li> <li>Digestion</li> <li>Blood and blood systems</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>Chapters 28-30</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>Tissue diagrams</li> <li>Bioethical Issue: Organ Transplants</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>AP Lab 10: Physiology of the Circulatory System</li> <li>Immunity Simulation</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>AP Lab 10: Physiology of the Circulatory System</li> <li>Immunity Simulation</li> <li>Read: Chapters 35-37</li> </ul>
Tuesday  <u>Structure and Function of Animals / Human Physiology, part 2</u> <i>Chapters 35 – 37</i>	<u>Human Body Systems</u> <ul style="list-style-type: none"> <li>Excretion</li> <li>Neuron structure</li> <li>Brain structure</li> <li>Impulse generation</li> <li>Gas exchange</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>Chapters 31-34</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>Bioethical Issue: The Nervous System</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>Tidal Volume Lab</li> <li>“Brain Caps”</li> <li>Eye dissection</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>Completion of lab</li> <li>Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>Tidal Volume Lab</li> <li>“Brain Caps”</li> <li>Read: Chapters 39-42</li> <li>Practice AP Essay 6</li> </ul>

Date	Topics	In-class Activities	Assignments and Assessments
Wednesday  <u>Structure and Function of Animals / Human Physiology, part 3</u> <i>Chapters 39 – 42</i>	<u>Human Body Systems</u> <ul style="list-style-type: none"> <li>• Locomotion</li> <li>• Endocrine system</li> <li>• Reproduction</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>• Chapters 35-37</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>• Discussion of the complex nature of the human body.</li> <li>• Endocrine Disorder Identification</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>• F2 generation counts</li> <li>• Human Body Case Study</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>• Completion of lab</li> <li>• Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>• AP Lab 7: Drosophila</li> <li>• Endocrine Disorder</li> <li>• Case Study</li> <li>• Read fetal pig dissection lab</li> </ul>
Thursday  <u>Final Exam Review</u>	<u>Review</u> <ul style="list-style-type: none"> <li>• Review for final exam</li> </ul>	<u>Daily Quiz</u> <ul style="list-style-type: none"> <li>• Chapters 39-42</li> </ul> <u>Activities</u> <ul style="list-style-type: none"> <li>• Various review strategies</li> </ul> <u>LABS</u> <ul style="list-style-type: none"> <li>• Pig dissection</li> </ul>	<u>Assessment</u> <ul style="list-style-type: none"> <li>• Daily quiz</li> </ul> <u>Homework</u> <ul style="list-style-type: none"> <li>• STUDY</li> </ul>
Friday  Final Exam!	<b>GOOD</b>	<b>LUCK</b>	<b>!!!!</b>

### CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.