



Course Overview

This course aims to have students make connections between the four big ideas as presented in the AP Biology Curriculum Framework. This course is the equivalent of two semesters of an introductory biology course. The course is designed to prepare students for the AP Biology Exam

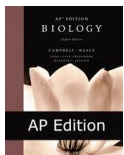
The main goals of AP Biology at Ledyard High School are: to help students develop a conceptual framework for modern biology and to help students gain an appreciation of science as a process. The ongoing information explosion in biology makes these goals even more challenging. Primary emphasis in an Advanced Placement Biology course should be on developing an understanding of concepts rather than on memorizing terms and technical details. Essential to this conceptual understanding are the following: a grasp of science as a process rather than as an accumulation of facts; personal experience in scientific inquiry; recognition of unifying themes that integrate the major topics of biology; and application of biological knowledge and critical thinking to environmental and social concerns.

Students will be engaged in hands on labs making up at least 25% of the instructional time. **[CR7]** Labs will emphasize the scientific process including testing of hypotheses, collection and analysis of data as well as presenting conclusions and assessing the validity of their work. This will be accomplished through reporting of all laboratory investigations **[CR 8]**. The labs that students complete will allow them to utilize the seven science practices as outlined in the Curricular Framework. A minimum of two labs in each big idea will be conducted **[CR 6]**.

In addition, students will engage in reading and writing of abstracts and/or discussion of journal articles from contemporary sources. This will encourage students to examine some of the many unanswered questions that exist in Biology today and relate them to their in class experiences. Field trip opportunities will be utilized (school budget permitting) both during the time before the exam (ie. Genetic Update Conference) and during the time after the exam (Ecol. Study of Pine Island, Population Study & Nesting Behaviors of Coastal Birds, and visit labs & clinic of Yale Cancer Center).

The 2012-2013 school year will prove to be an exceptionally challenging one with adopting this new curriculum and adopting a new school schedule at Ledyard High School. Ledyard High School had a 4x4 block with Fall semester meeting every day for 84 minutes and a Spring semester meeting every other day for 84 minutes. We are moving to a schedule where Monday meets for 40 minutes (AP sciences get two -40 minute meetings on this day but not necessarily back to back) and Tues-Thurs meet for 80 minutes in the Fall. Spring would entail meeting every other day on Tues-Thurs with the Monday a 40 minute meeting.

Materials



Campbell, Neil and Reece, Jane B. 2008 *Biology*, Eighth Edition (AP Edition), San Francisco, CA: Pearson- Benjamin Cummings. [CR1]

AP Biology Investigative Labs: An Inquiry Based Approach, The College Board, 2012.

Released multiple choice and free response sections of AP Biology Tests from 1999 - present.

Electronic Resources (Partial List)

Prentice Hall Virtual Lab Bench

Prentice Hall Biocoach

Campbell Biology Online Resources for Students

NCBI

“Inner Life of the Cell”- Harvard.edu

Supplementary or Outside Readings

Bartholet, Jeffrey. *Scientific American*. "Inside the Meat Lab". June 2011, pg 65-69.

Bonasio, Roberto, et al. *Science*. "Molecular Signals of Epigenetic States". October 9, 2010, pg 612-615.

Choi, Charles. *Scientific American*. "A Theory of a Deadly Fusion". January 2009, pg 100-103.

Church, George. *Scientific American*. "Genomes for ALL". January 2006, pg 47-54.

Cloud, John. *Time*. "Why Genes Aren't Destiny". January 18, 2010, pg 49-53.

Collins, Francis and Anna Barker. *Scientific American*. "Mapping the Cancer Genome". March 2007, pg 50-57.

Hagmann, Michael. *Science*. "Embryos Attacked by Mom's Natural Defenses". January 21, 2000, p.408.

Hall, Stephan. *Scientific American*. "Revolution Postponed". October 2010, pg 60-67.

Hochedlinger, Konrad. *Scientific American*. "Your Inner Healers". May 2010, pg 47-53.

Kaiser, Jocelyn. *Science*. "Looking for a Target on Every Tumor". October 9, 2009, pg 218-220.

Kaiser, Jocelyn. *Science*. "Combining Targeted Drugs to Stop Resistant Tumors". March 25, 2011, pg 1542-1545.

Kappe, Stefan and Sebastian Mikolajczak. *Science*. "Another Shot at a Malaria Vaccine". October 29, 2011, pg 460-461.

- Khademhosseini, Ali, Joseph P. Vacanti, and Robert Langer. *Scientific American*. "Progress in Tissue Engineering". May 2009, pg 64-71.
- Kingsley, David. *Scientific American*. "From Atoms to Traits". January 2009, pg 52-59.
- Kolbert, Elizabeth. *The New Yorker*. "The Sixth Extinction?". May 25, 2009, pg 53-63.
- Lamb, Trevor D. *Scientific American*. "Evolution of the eye". July 2011, pg 64-69.
- Milius, S. *Science News*. "Separate Vacations". October 9, 2004, pg 228, 230.
- Mindell, David. *Scientific American*. "Evolution in the Everyday". January 2009, pg 82-89.
- Nielsen, Peter. *Scientific American*. "A New Molecule of Life?". December 2008, pg 64-71.
- Orr, Allen. *Scientific American*. "Testing Natural Selection". January 2009, pg 44-51.
- Portela, Anna and Manel Esteller. *Nature Biotechnology*. "Epigenetic modifications and human disease". October 2010, vol. 28, no. 10, pg 1057-1068.
- Schoofs, Mark. *The Wall Street Journal*. "A Doctor: a Mutation and a Potential Cure For AIDS". November 7, 2008.
- Schreibner, Hans and Donald Rowley. *Science*. "Awakening Immunity". November 5, 2010, pg 761.
- Shubin, Neil. *Scientific American*. "This Old Body". January 2009, pg. 64-67.
- Skloot, Rebecca. *Oprah.com*. "The Miracle Woman". January 22, 2010.
- Vogel, Gretchen and Elizabeth Pennisi. *Science*. "U.S. Researchers Recognized for Work on Telomeres". October 9, 2009, pg 212-213.
- von Hofe, Eric. *Scientific American*. "A new ally against cancer". October 2011, pg 66-71.
- Watters, Ethan. *Discover*. "DNA is not Destiny". November 2006, pg 32-37; 75.
- Wong, Kate. *Scientific American*. "The Human Pedigree". January 2009, pg 60-63.
- Zimmer, Carl. *The New York Times*. "Answers Begin to Emerge on How Thalidomide Caused Defects". March 15, 2010.

Unit 1: Ecology
Big Idea(s) 4, 1 [CR 2]

Topics	Readings	Labs & Activities	Assessments
Ecological Interactions Behavioral Ecology Population Dynamics Community Ecology	Ch. 50, 51,52,53,54	Lincoln-Peterson Index Activity [CR 6] (SP 1,2,5) Student generated abstract and/or discussion of journal article - "Separate Vacations: Birds winter apart but return in sync" <i>Science News</i> , 2004	Student generated outlines of target chapter(s) within unit Unit test with objective and free response questions (modeled after the AP Biology Exam)

Unit 2: Ecosystems and Introductions to Biology
Big Ideas 4, 1 [CR 2]

Topics	Readings	Labs & Activities	Assessments
Ecosystems Conservation Biology & Restoration Ecology Themes in the Study of Life	Ch. 55, 56, 1	Dissolved Oxygen & Productivity lab (LT/DK Bottles with <i>Ulva lactuca</i>) [CR 3d] , [CR4d] , [CR 5] , [CR 6] (SP 2-7)	Student generated outlines of target chapter(s) within unit Unit test with objective and free response questions (modeled after the AP Biology Exam)

Unit 3: Chemistry of Life

Big Idea(s) 2,4 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Chemical Context of Life</p> <p>Water and the Properties that Support Life</p> <p>Carbon's Importance in Living Things</p> <p>Biological Macromolecules</p>	<p>Ch. 2,3,4,5</p>	<p>Use kit to build macromolecule models [CR4a] (SP1)</p> <p>Student generated abstract and/or discussion of journal article - "Answers begin to Emerge on How Thalidomide Caused Defects" <i>The New York Times</i>, 2010</p>	<p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Unit 4: Cell Structure, Function & Energy Use

Big Idea(s) 2,3,4 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Cell Structure & Function</p> <p>Evol. Relationships and Similarities/ Differences between Prokaryotes & Eukaryotes</p> <p>Cell Membrane Structure and Function</p> <p>Metabolism, ATP structure & function</p> <p>Enzyme Catalysis</p> <p>Cellular Respiration</p> <p>Photosynthesis</p>	<p>Ch 6,7,8,9,10</p>	<p>Investigative Lab #1 Diffusion & Osmosis -movement of solute through membrane (dye) -use of dialysis tubing and solutions to illustrate osmosis in non living system [CR 6] [CR 4b] (SP 2-7)</p> <p>Inquiry Lab #4 Diffusion & Osmosis [CR 6] (SP 2-7)</p> <p>Inquiry Lab #13 Enzyme Activity [CR 6] [CR 3d-Big Ideas 2&4 connected] (SP 2-7)</p> <p>Inquiry Lab # 5 Photosynthesis [CR 6] (SP 2-7)</p>	<p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Inquiry Lab Report [CR 8]</p> <p>Investigative Lab</p> <p>Discussion of endosymbiosis and the hypothesis of the evolution of eukaryotic cells (CR3b)</p>

Unit 5: Cell Signaling, Genetics & Molecular Basis for Inheritance

Big Idea(s) 1,2,3,4 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Cell communication</p> <p>Cell cycle mechanisms and control</p> <p>Sexual and asexual reproduction & evolutionary roles</p> <p>Mechanisms of genetic variation, impacts on evolution</p> <p>Effect of Environment on Genetics</p> <p>Structure of DNA & Replication</p>	<p>Ch. 11,12,13,14,15,16</p>	<p>Inquiry Lab #7</p> <p>Cell Division: Mitosis & Meiosis [CR 6] & [CR 3c-Big Ideas 3 & 1]</p> <p>Punnett square activities</p> <p>Chi-Square Activity [CR 4a] & [CR 4c]</p> <p>Student generated abstract and/or discussion of journal article - "U.S. Researchers Recognized for Work on Telomeres" <i>Science</i>, 2009</p>	<p>Chi Square Activity</p> <p>Inquiry Lab Report [CR 8]</p> <p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p> <p>Students research and report on role of genes vs. environment for a topic such as cancer, obesity, psychiatric disorders [CR 5]</p>

Unit 6: Gene Expression, Gene Control, Biotechnology & Genome Evolution

Big Idea(s) 3, 1, 4, 2 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Protein Synthesis</p> <p>Regulation of Gene Expression</p> <p>Viruses</p> <p>Biotechnology (ie. PCR, rDNA, electrophoresis, RFLPs, etc.)</p> <p>Genome Evolution (ie. mechanisms of genome evol, comparative studies- clues to development?)</p>	<p>17, 18, 19, 20, 21</p>	<p>Inquiry Lab #9 Biotechnology: Restriction Enzyme Analysis of DNA [CR 6] (SP 2-7)</p> <p>Student generated abstract and/or discussion of journal article -"A New Ally against Cancer". <i>Scientific American</i>, 2011</p> <p>Student generated abstract and/or discussion of journal article - "Epigenetic modifications and human disease" <i>Nature Biotechnology</i>, 2010</p>	<p>Inquiry Lab Report [CR 8]</p> <p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Unit 7: Mechanisms of Evolution

Big Idea(s) 1,3 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Darwin & Descent with Modification/ Natural Selection</p> <p>Populations & Speciation</p> <p>Hardy Weinburg Equilibrium</p> <p>History of Life on Earth & Phylogeny</p>	<p>Ch. 22,23,24,25,26</p>	<p>Inquiry Lab #2 Mathematical Modeling: Hardy-Weinberg [CR 6] (SP 1-7)</p> <p>Inquiry Lab #3 Comparing DNA Sequences to Understand Evolutionary Relationships with BLAST [CR 6] (SP 2-7)</p> <p>Student generated abstract and/or discussion of journal article - "From Atoms to Traits" <i>Scientific American</i>, 2009</p>	<p>Inquiry Lab Report [CR 8]</p> <p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Unit 8: Biological Diversity, Historical & Evolutionary Perspective

Big Idea(s) 1,3 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Evolution of Prokaryotes & Eukaryotes</p> <p>Evol. History of Plants</p>	<p>Ch. 27, 28, 29, 30</p>	<p>Poster to compare organelles/cell structures from organisms in 3 different major taxa [CR 3a- Big Ideas 1 & 3 connected] (SP 1)</p> <p>Student observations made on bryophytes → pterophytes → gymnosperms → angiosperms in the lab [CR 6] & [CR 4a]</p> <p>Student generated abstract and/or discussion of journal article -"Another Shot at a Malaria Vaccine". <i>Science</i>, 2011.</p>	<p>Poster described in column at left.</p> <p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Unit 9: Animal Form & Function I

Big Idea(s) 1, 2 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Basic Principles of Animal Form & Function</p> <p>Digestive System</p> <p>Circulatory & Respiratory Systems</p> <p>Immune System</p> <p>Excretion & Osmoregulation</p>	<p>Ch. 40,41,42,43,44</p>	<p>Investigative lab #10 Physiology of the Circulatory System [CR 6] & [CR 4b] (SP 2-7)</p> <p>Lung Volume and CO₂ output lab. -students measure lung volume and use titration to calculate mMoles of CO₂/min exhaled. [CR 6] (SP 2-7)</p> <p>Student generated abstract and/or discussion of journal article “Awakening Immunity” <i>Science</i>, 2010.</p>	<p>Investigative lab results</p> <p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Unit 11: Animal Form & Function II

Big Idea(s) 1,2 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Endocrine System</p> <p>Neurons, action potentials, major parts of the human brain</p> <p>Sensory & Motor Mechanisms</p>	Ch 45,48,49.2, 50	<p>Student generated abstract and/or discussion of journal article “This Old Body” <i>Scientific American</i>, 2009. [CR 4a]</p>	<p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Unit 12: Plant Form & Function

Big Idea(s) 1,2,3 [CR 2]

Topics	Readings	Labs & Activities	Assessments
<p>Structure, growth & development</p> <p>Resource Acquisition & Transport</p> <p>Angiosperm Reproduction</p> <p>Plant Response to Stimuli</p>	Ch 35,36,38,39	<p>Inquiry lab #11 Transpiration [CR 6] (SP 2-7)</p>	<p>Inquiry Lab Report [CR 8]</p> <p>Student generated outlines of target chapter(s) within unit</p> <p>Unit test with objective and free response questions (modeled after the AP Biology Exam)</p> <p>Student abstracts and/or discussion</p>

Curricular Requirements	Page(s)
CR1 Students and teachers use a recently published (within the last 10 years) college-level textbook.	2
CR2 The course is structured around the enduring understandings within the big ideas as described in the AP® Biology Curriculum Framework.	4 - 12
CR3a Students connect the enduring understandings with Big Idea 1 (the process of evolution drives the diversity and unity of life) to at least one other big idea	9, 10
CR3b Students connect the enduring understandings with Big Idea 2 (biological systems utilize free energy and molecular building blocks to grow, reproduce and maintain dynamic homeostasis) to at least one other big idea	5, 6
CR3c Students connect the enduring understandings with Big Idea 3 (living systems store, transmit and respond to information essential to life processes) to at least one other big idea	7
CR3d Students connect the enduring understandings with Big Idea 4 (biological systems interact and these systems and their interactions possess complex properties) to at least one other big idea	4, 6, 7,8
CR4a The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 1	2,3,5, 7, 10, 12
CR4b The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2	2,3, 6, 11
CR4c The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 3	2, 3, 7
CR4d The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 4	2, 3, 4
CR5 The course provides students with opportunities to connect their biological and scientific knowledge to major social issues (ie. concerns, technological advances, innovations) to help them become scientifically literate students	4, 7
CR6 The student directed laboratory investigations used throughout the course allow students to apply the 7 science practices defined in the AP® Biology Curriculum Framework and include at least 2 lab experiences in each of the four big ideas.	1, 4, 6 - 12
CR7 Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25% of instructional time.	1
CR8 The Course provides opportunities for students to develop and record evidence of their verbal, written and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written or graphic presentations	1, 6, 8, 9