

# AP Biology

## Philosophy

The Advanced Placement Biology course is designed to be the equivalent of a college introductory biology course taught in a high school setting. As such, the students will be required to do college-level work in order to be successful. *AP Biology* is a course designed for students that have a strong interest in, or desire to pursue a career in, the sciences. The *AP Biology* course is designed to offer students topics that are covered in a freshman Biology course at the university level. Students accepting the challenge of an Advanced Placement course will be required to actively participate in all lectures and laboratory activities that are conducted during the year.

To succeed in *AP Biology*, students must be highly motivated to learn. Reading requirements for the course are rigorous and require a daily commitment in order to stay caught up in the class. Exams generally cover two chapters in the text and occur every week depending on the content being covered and the labs being conducted to give students a fair representation of a university-level Biology course. Before they delve into this awesome task, they should seriously examine why they are here. If it is for college credit, then they should establish if their future school accepts *AP* credit; if it is for an intellectual challenge, then I will gladly help them with this goal.

## Materials

Campbell, Neil and Reece, Jane B. 2011. *AP Edition Biology*, Ninth Edition, San Francisco, CA: Pearson Benjamin Cummings. [CR1]

Campbell, Neil. *Student AP Edition Biology Student Study Guide*, Ninth Edition (ISBN - 13: 978-0-321-62992-0)

*Biology Laboratory Manual*, 8/e by Vodopich and Moore, 2011

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

## Course Overview

In AP Biology, an emphasis is on students making connections between the big ideas within the AP Biology Curriculum Framework. I teach the equivalent of an introductory college-level biology course, and it is designed to prepare students for the AP Biology Exam.

My philosophy is to actively engage students in the process of science through class assignments and discussions which inform their laboratory experiences. For example, I increase students' critical thinking and problem solving abilities by actively requiring them to develop labs through group discussions, journal readings and hands-on labs. Emphasis is also given to journal article readings in order to expose students to present day technologies and procedures to familiarize them to limitations of testable hypotheses in order to develop better designed experimental investigations.

Lab techniques are learned through researching journal papers, hands-on labs which make up at least 25% of instructional time, and at least one field trip to west coast tide pools. [CR7] Labs emphasize development and testing of the hypothesis, collection, analysis and presentation of data, as well as discussion of results to discover unanswered questions about the particular topics addressed. A minimum of two labs in each big idea will be conducted. [CR6] Students are required to report on all laboratory investigations. [CR8] The student-directed and inquiry-based laboratory investigations used throughout the course enable students to apply the seven science practices as defined in the Curriculum Framework.

## Evaluation Scheme

Students will be graded primarily on tests, quizzes, homework and laboratory work a la a typical college, entry-level Biology course. Course grades will be calculated on total point system using traditional grading scale of 100-90% (A), 89-80% (B), 79-70% (C), 69-60% (D), and 59%-below (F). Unlike non-AP courses, assignments may be graded formally – many assignments may not.

Tests: 60%

Free-Response Questions: 10%

Labs: 25%

Homework: 5%

## Research Project

Each semester the students are required to do a project. The first semester, they are to create a cell book. The book includes three chapters. First chapter is a model of a cell constructed on transparencies showing the structures and parts of a cell. Each page holds a different organelle. Included are the functions of each part. The must have a minimum of 16 organelles. Second chapter must include a description and summary on two

different types of cell. Also, how the cells impact a multi-cellular body. Chapter three, they need to research two diseases that impact cells specifically.

The second semester they create a power point presentation, covering a major concept found in AP Biology. They need to describe and discuss how this concept has impacted Science, technology, and society (environmental and social concerns).

## **Instructional Material**

Online Campbell Biology Book

Scientific Articles: Newspapers, magazines, news broadcasts, Internet, public forums

Videos

DVDs

Speakers: When available

Journals: (optional)

Cells Alive

## AP Biology Syllabus

### Curricular Requirements

### Pages

<b>CR1</b>	Students and teachers will use a recently published (within last 10 years) college-level textbook.	<b>1</b>
<b>CR2</b>	The course is structured around the enduring understanding within the big ideas as described in the AP Biology Curriculum Framework.	<b>2,3,4,5,6,7,8,9,10</b>
<b>CR3a</b>	Students connect the enduring understandings within Big Idea 1 (the process of evolution drives the diversity and unity of life) to at least one other big idea.	<b>3,4,9</b>
<b>CR3b</b>	Students connect the enduring understandings within Big Idea 2 (biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic Homeostasis) to at least one other big idea.	<b>4</b>
<b>CR3c</b>	Students connect the enduring understanding within Big Idea 3 (living systems store, retrieve, transmit, and respond to information essential to life processes) to at least one other big idea.	<b>6</b>
<b>CR3d</b>	Students connect the enduring understanding within Big Idea 4 (biological systems interact and these systems and their interactions possess complex properties) to at least one other big idea.	<b>2,3,5,10</b>
<b>CR4a</b>	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 1.	<b>2,3,4,8</b>
<b>CR4b</b>	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2.	<b>2,3,4,5</b>
<b>CR4c</b>	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 3.	<b>3,4,6</b>
<b>CR4d</b>	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 4.	<b>3,10</b>
<b>CR5</b>	The course provides students with opportunities to connect their biological and scientific knowledge to major social issues (e.g., concerns, technological advances, innovations) to help them become scientifically literate citizens.	<b>4,5,6,9,10</b>
<b>CR6</b>	The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and includes at least two lab experiences in each of the four big ideas.	<b>1,2,3,4,5,6,7,8,9,10</b>
<b>CR7</b>	Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional time.	<b>1</b>
<b>CR8</b>	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.	<b>1,2,3,4,5,9,10</b>

MOLCEULES, CELLS & ENERGY Big Ideas 1, 2, 3 & 4 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>A. MOLECULES</b> Big idea 4  Polarity of water & its importance to biological systems  Carbon's role in the molecular diversity of life  Monomers, polymers & reactions involved in building & breaking them down considering polar/ nonpolar interactions  Various levels of structures in protein & carbohydrates  Enzyme structure as a special protein  Cohesion, adhesion, specific heat of water & its importance to biological systems  Acids, bases, and buffers	Chemistry of Life  Chapters 2-5 from textbook	Using kits to build macro-molecule models [CR4a] (SP 1)  Exercises: protein folding software [CR4b]  Acid/base/buffer lab activity [CR6] (SP 2)  Adhesion/ cohesion lab  Students do variations by adding different macro-molecules to solution to see effects adhesion etc. (EU4.A connects to BI 1) [CR3d] (SP 4)  Given specific heat equation, in groups students try to come up with a way to determine specific heat of water. 15min (EU 4.C connects to BI 1) [CR3d], [CR4a] & [CR4b] (SP 3)	Student generated concept maps  Reading quizzes Unit test with free response practice Written lab reports [CR8]

CR2: The course is structured around the enduring understandings within the big ideas as described in the AP Biology Curriculum Framework.

CR4a: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 1.

CR4b: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2.

CR6: The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.

MOLCEULES, CELLS & ENERGY		Blg Ideas 1, 2, 3 & 4 [CR2]	
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
Identifying macro-molecules in our foods  Supplements & Add. ions:  Cohesion/ adhesion in nature  Various macro-molecules in our foods  Cycling of chemical elements in ecosystem	Portion of Chapter 55	LAB: Using and understanding how different indicators are used to identify proteins, lipids, carbohydrates (incl. reducing sugars analysis) using Biuret, Benedict's, Sudan etc. [CR6] (SP 6)  Research exploring how animals use water's properties for survival (comparing specific heat) (EU 4.C connects to BI 1) [CR3c]  Students make posters of different element cycles including relative amts. of transfer [CR4b], [CR4d] & [CR8]	Students compose chart comparing structural differences & how indicators physically work  Students use chart to predict contents of unknown samples  Students share one example they have found how animals use water's properties for survival.  Student generated short PowerPoints on macro-molecules and nutrition. (Ex. Butter vs margarine vs oil OR summarizing different artificial sweeteners)
<b>B. HISTORY OF LIFE</b> Big idea 1  Theories of how macro-molecules joined to support origin of life  Was RNA 1st genetic material?  Age of earth	Text chapter 25  outline notes  guided reading	Clay catalyzed RNA polymerization activity with role playing focus on theories, redevelopment of theories over time (EU 1.B connects to BI 3) [CR3a] & [CR4c] (SP 6, 7)  Discussion of journal article	Concept maps Reflection on the development and reformulation of scientific theories  (extra) model or cartoon explaining the theories of origin of life [CR4a]

CR2: The course is structured around the enduring understandings within the big ideas as described in the AP Biology Curriculum Framework.

CR4d: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 4.

CR4b: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2.

CR3d: Students connect the enduring understandings within Big Idea 4 (biological systems interact and these systems and their interactions possess complex properties) to at least one other big idea.

MOLCEULES, CELLS & ENERGY			
Big Ideas 1, 2, 3 & 4 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>C. CELLS</b> (structure & function) Big idea 1 & 2  Explain similarities, differences & evolutionary relationships between prokaryotic & eukaryotic cells  Cell membrane structure & function  Cell communication (signals, receptors, responses hormones)  Methods of transport across membranes	Text chapters 6,7,11	Mini poster/ models comparing structures of cells from 3 different cell types from 3 different kingdoms (EU 1.A connects to BI 3) [CR3a], [CR4a], [CR4c] & [CR8]	Student generated concept maps  Reading quizzes
	Outline notes		Mini poster comparing structures of cells from 3 different kingdoms
	Guided reading questions		Unit test with Free Response practice
	Journal articles on organelle based health issues [CR5]	LAB: Normal vs Plasmolyzed Cells using Plant cells (teacher generated) [CR6]	Written lab reports [CR8]
		Eduweblabs: Osmosis & diffusion prelabs 1 & 2 [CR4b], [CR4c] & [CR6]	Eduweblabs graph & calculations
		Cell size lab teacher generated	Cell Size lab calculations
		Mini Poster Presentations comparing 3 feedback mechanisms [CR8]	Formal Lab Writeup for Inquiry lab Diffusion & Osmosis [CR8]
	Inquiry lab # 4 Diffusion and Osmosis [CR6] (SP 3, 4)	Microscope drawings & calculation Analyze & Discuss chart comparing different types of cells & their functions in the human body	
	LAB: Microscope techniques for observing & measuring different types of cells.	Discussion of the endosymbiont hypotheses of the evolution of eukaryotic cells [CR3b]	
<b>D. IMMUNITY</b> Bigidea 2&3 Innate vs Acquired Response Humoral responses B cells vs T cells Self vs non-self Field Trip to Pharmaceutical Company	Text chpt. 43	LAB: Immunoassays: Antibody purification	Student generated concept maps
	Background information on immunoassays from the company.	Dot Blot (1 full day at BTI Pharmaceutical company where students completely perform both labs) [CR6] (SP 5)	Flow chart for immunoassay labs  Post-fieldtrip quiz

CR3a: Students connect the enduring understandings within Big Idea 1 (the process of evolution drives the diversity and unity of life) to at least one other big idea.

CR4c: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 3.

CR3b: Students connect the enduring understandings within big idea 2 (biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis) to at least one other big idea.

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.

MOLCEULES, CELLS & ENERGY Big Ideas 1, 2, 3 & 4 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
E. CELL ENERGY	Text chpts 8, 9, 10	Eduweblabs: Prelab "Enzyme Catalysis"	Student generated concept maps
ATP structure & function	Outline notes	Investigative lab #13: Enzyme Activity (EU 4.A connects to BI 2) [CR3d] & [CR6]	Reading quizzes
Redox reactions in relation to cellular respiration	Guided reading questions	Prelab: Toothpickase	Unit test with free response practice
Enzyme catalysis		Investigative Lab: Enzymes: Factors affecting the rate of activity [CR6] (SP 2, 5)	Eduweblab graphs Toothpickase graphs & questions
Activation energy & specificity		Eduweblab: Respiration [CR4b]	Presentation of students group lab results to class [CR8]
Cellular respiration glycolysis, citric acid cycle, electron transport chain & chemiosmosis		Investigative Lab #6 Cellular Respiration [CR6] (SP 2)	Eduweblabs graphs & calculations
Mitochondria form & function		Fermentation in Yeast Lab (Flynn kit) student generated variations required	Presentations of lab data and results [CR8]
Photosynthesis mechanisms; light/ dark		Eduweblabs: Prelab Plant pigments [CR4b]	Graphs & discussion on Yeast Lab with variations [CR8]
Compare/contrast to respiration		Eduweblabs: Prelab Photosynthesis [CR4b]	Eduweblabs chromatography calculations, graphs
Alternative mechanisms		Investigative Lab #5 Photosynthesis [CR6]	Presentations on lab results
Understanding light energy & the nano scale (the size of small things inside cells)		Internet activity comparing different wavelengths of light in relation to photosynthesis (teacher generated)	Lab writeup and analysis [CR8]
		Discussion on nanotechnology & implications of our smaller world [CR5]	Students make a chart comparing sizes of cellular parts & larger items to evaluate range of metric distance measurements down to the nano scale [CR4b]

CR3d: Students connect the enduring understandings within Big Idea 4 (biological systems interact and these systems and their interactions possess complex properties) to at least one other big idea.

CR5: The course provides students with opportunities to connect their biological and scientific knowledge to major social issues (e.g., concerns, technological advances, innovations) to help them become scientifically literate

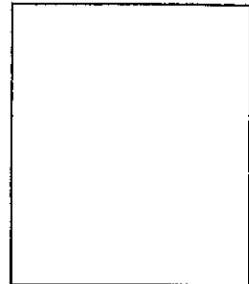
CR4b: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2.

CR6: The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.



HEREDITY, GENETICS & EVOLUTION Big Ideas 1 & 3 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>A. MOLECULAR BASIS OF INHERITANCE</b>  DNA structure & replication  RNA structure  Protein Synthesis transcription & translation  Mutations - basis for natural selection	Text chapters 16, 17  Journal Article Reading  Watson and Crick's original Nature paper from 1953	DNA extraction  Comparing DNA & protein sequences from an internet based computer database in discussing evolutionary implications of mutations (SP 7)	Student generated concept maps  Reading quizzes  Journal article discussions  Unit test with Free Response practice  Bioinformatics results
<b>B. MITOSIS &amp; MEIOSIS</b>  Cell Cycle mechanism & control  Chromosomes  Sexual vs asexual reproduction & evolutionary advantages  Stages of meiosis  Genetic variation in offspring, mechanisms & impact on evolution  Investigating genetics: environmental influences	Text chapters 12, 13	Eduweblabs: Prelab Crossing Over Lab  Investigative Lab #7: Mitosis and Meiosis (EU 3.A connects to BI 1) [CR3c] & [CR6]  Karyotyping exercise (teacher generated, students will have to do this on their own time) [CR4c]	Student generated concept maps  Reading quizzes  Unit test with Free Response practice  Eduweblabs results  Investigative LAB Analyses  Karyotyping results  Students choose & research controversial topics and the arguments supporting their genetic and/or environmental basis. Ex. Obesity, alcoholism, etc. [CR5]

CR2: The course is structured around the enduring understandings within the big ideas as described in the AP Biology Curriculum Framework.

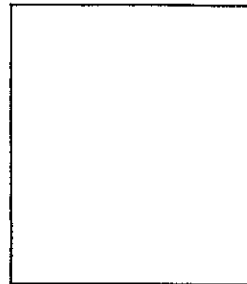
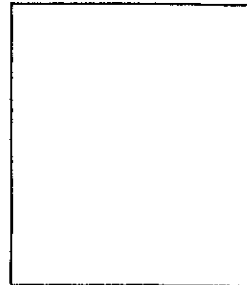


CR3c: Students connect the enduring understandings within Big Idea 3 (living systems store, retrieve, transmit, and respond to information essential to life processes) to at least one other big idea.

CR4c: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 3.

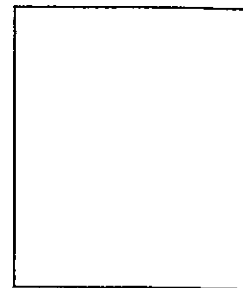
HEREDITY, GENETICS & EVOLUTION Big Ideas 1 & 3 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>C. MENDELIAN GENETICS</b> <b>MENDEL'S LAWS</b>  Patterns of inheritance  Predicting genetic outcomes genetic counseling  Gene linkage & mapping  Mutations revisited	Text chapters 14, 15  Scientific American Article Reading	Prelab activity: Looking at corn crosses & analyzing results  Eduweblabs: Prelab Population Genetics  Eduweblabs: Prelab Fruit fly genetics	Student generated concept maps  Reading quizzes  Journal article discussions  Unit test with free response practice  Eduweblabs prelab report
<b>D. MOLECULAR GENETICS</b>  Regulation of gene expression  Viruses  Gene expression in bacteria  Biotechnology DNA Technology, Recombinant DNA, PCR, Gel electrophoresis  Applications of DNA technology  Use of bioinformatics to analyze genomes  Comparing & discussing genomic sequences in relation to evolution	Text chapters 18-21  Journal Article Reading  Article by Kary Mullis on PCR.	Eduweblabs: Prelab Bacterial transformation  Eduweblabs: Prelab DNA Electrophoresis  Investigative lab #9: Bio- technology I and Biotech- nology II. Bacterial Trans- formation and Restriction Enzyme Analysis of DNA [CR6]	Student generated concept maps  Reading quizzes  Journal article discussions  Unit test with free response practice  Eduweblabs results for both transformation & electrophoresis labs  Analysis and group presentation of Investigative lab

**CR2:** The course is structured around the enduring understandings within the big ideas as described in the AP Biology Curriculum Framework.

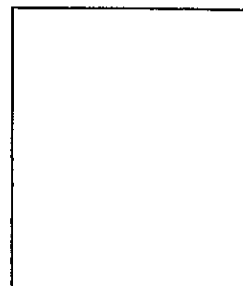


**CR6:** The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.

MOLCEULES, CELLS & ENERGY Big ideas 1, 2, 3 & 4 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>E. EVOLUTIONARY BIOLOGY</b>  Darwin's explorations and theory of descent with modification & natural selection  Galapagos Islands Overview  Evidence for evolution (molecular analyses & morphological analyses)  Phylogeny & systematics  Evolution of populations  Hardy-Weinberg Law	Text chapters 22-25  Journal Article Reading  Beak of the Finch by Jonathan Weiner	Activity: Genetics Survey Project analyzing traits of those around us  Lab Investigation "2 Mathematical Modeling: Hardy-Weinberg [CR6] (SP2, 4, 5, 7)  Activity: Students create Geologic timeline  Activity: Hands on fossil analysis (obtained from nearby college) [CR4a] (SP 6, 7)	Student generated concept maps  Reading quizzes  Book discussions  Unit test with Free Response practice

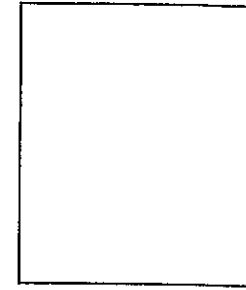


CR4a: The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 1.



CR6: The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.

ORGANISMS & POPULATIONS Big Ideas 1, 3 & 4 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>A. BIOLOGICAL DIVERSITY &amp; MICROBIOLOGY</b>  Early life on earth  Evolution of prokaryotes & eukaryotes	Text chapters 25, 26, 27   Text 29.30	Students are to find an article involving genetic recombination using prokaryotes and present to class [CR5]  Investigative LAB # 3: Analyzing Genes with BLAST (EU 1.B connects to BI 4) [CR3a] & [CR6]	Article presentation to class  Student generated concept map  Section test
<b>B. PLANTS &amp; THEIR DIVERSITY</b>  How plants colonized and  Evolution of seed plants Structure, growth & development  Plants responses to internal & external stimuli  Plant nutrition  Angiosperm Reproduction	Text 35, 36   Text 37, 38, 39	Eduweblabs: Prelab Transpiration  Investigative LAB # 11: Transpiration (EU 1.B connects to BI 4) [CR3a] & [CR6] (SP 2, 3, 5)  LAB: Flower dissection  LAB: Students conduct a long term (exp't) lab investigation plant growth from seeds under various conditions in our green- house. [CR6] (SP 3.5, 6, 7)	Practical Test specimen identifica- tion & placing on phylogenetic tree  Student generated concept map  Section test  Eduweblab transpiration results  Investigative labs analysis  Flower dissection practical  Formal writeup for students' own plant lab [CR8]
<b>C. ANIMAL DIVERSITY</b> Characteristics (body plans & systems) of invertebrates as you go up the phylogenetic tree Basic anatomy principles Analysis of structure & function of body systems Digestive, Circulatory, Respiratory, Excretory, Endocrine, Nervous, Muscular Systems	Text chapters 32-34 and 40-49	Survey of animal phyla in concept map/chart form generated by students (Practical with actual animal specimens) Eduweblabs - Daphnea heart rate Eduweblabs - Cardiac Physiology Human Biology: Circulation and Blood Pressure Lab: Examining circulation of the goldfish [CR6] (SP 7) Lab: Dissection - Cat	Student generated concept maps (one for each system & animal diversity examination) Reading quizzes Unit test with Free Response practice Eduweblab reports Practical quiz observing various specimens and classifying them using students' own made chart of animal phyla Practical test with dissection specimen



**CR5:** The course provides students with opportunities to connect their biological and scientific knowledge to major social issues (e.g., concerns, technological advances, innovations) to help them become scientifically literate.

**CR3a:** Students connect the enduring understandings within Big Idea 1 (the process of evolution drives the diversity and unity of life) to at least one other big idea.

**CR6:** The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.

ORGANISMS & POPULATIONS Big Ideas 1, 3 & 4 [CR2]			
TOPICS	READINGS	ACTIVITY/LABS	ASSESSMENT
<b>D. ECOLOGY</b>	Text chapters 50-55	Eduweblabs: Prelab Animal Behavior	Student generated concept maps
Ecological interactions- biotic vs abiotic		Investigative LAB #12: Fruit fly behavior [CR6] (SP 3, 4)	Reading quizzes
Behavioral ecology- natural selection involvement		Animal Behavior: Taxis, Kinesis, and Agonistic Behavior [CR6] (SP 3, 4, 6)	Unit test with Free Response practice
Population dynamics- growth & its regulations		LAB: Termite Behavior (WARD'S) Wolbachia Project- PCR in conjunction with the Marine Biology Institute in Boston, students will conduct research looking at the presence of symbiotic relationship in insects with Wolbachia (EU 4.A connects to BI 1) [CR3d] & [CR4d] (SP 3, 4, 5)	Eduweblab reports Investigative Lab #11 report [CR8]
Communities & Ecosystems energy levels & flows, cycles, symbiosis & impact on evolution		Eduweblabs- Primary Productivity	Termite lab questions, analysis and presentation [CR8]
Human influences positive & negative		LAB: Dissolved Oxygen & Aquatic Primary Productivity (EU 4.A connects to BI 1) [CR3d], [CR5] & [CR6] (SP 2, 3, 4, 5, 6, 7)	Eduweblab report on primary productivity
		LAB: Local Burpee museum field trip where students perform water quality surveys including benthic macroinvertebrate survey (EU 4.C connects to BI 1) [CR3d] & [CR6]	Presentation: Students present lab results to class with ways to improve water quality of their local river [CR5]
		Activity – "My footprint" (EU 4.A connects to BI 1) [CR3d] & [CR4d]	Personal Project: Students complete "My Footprint" on-line and write a paper discussing their individual impact on Earth [CR5]

CR5: The course provides students with opportunities to connect their biological and scientific knowledge to major social issues (e.g., concerns, technological advances, innovations) to help them become scientifically literate.

CR3d: Students connect the enduring understandings within Big Idea 4 (biological systems interact and these systems and their interactions possess complex properties) to at least one other big idea.

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.

### Additional Websites:

Websites for student use for review/homework/lab-prep are an irreplaceable tool for instructional purposes and student understanding. The following is a partial list of some of the sites I use on a daily/ weekly basis.

- The Biology Project - University of Arizona