

COURSE: AP BIOLOGY

PHILOSOPHY

I see an opportunity to encourage students to further their understanding of the world around them as a biology teacher. I use every opportunity to connect decisions that students make on a day to day basis with the themes of biology that connect all living things.

COURSE OVERVIEW:

AP Biology is a college level experimental science course that prepares students for the national examination in biology. This course examines living things from a molecular, cellular and complete organism perspective. The interactions between structure and function are stressed along with the interrelationships and interdependence of all organisms. Students will evaluate the place of humans in the environment and use this knowledge to appreciate the complexities of the biological systems. Students will demonstrate practical experimental skill, evaluate problems scientifically and value inquiry as a fundamental scientific process. In addition, emphasis is placed on the idea that holistic understanding of global issues and international perspectives are essential to scientific advancement.

AP Biology meets five days per week, sixty minutes per day for thirty-six weeks. Student conducted laboratories make up twenty-five percent of instructional time. Students are required to read the textbook chapters listed on the syllabus, and they take a test at the end of each unit.

The text used in this course is Biology, 6th edition (2002), Neil A. Campbell and Jane B. Reece, published by Benjamin Cummings.

Required reading is the selfish gene by Richard Dawkins

COURSE PLANNER

AP Biology is organized into 11 units and students are given the following syllabus on the first day of class. This syllabus will guide them through the course of study. We spend approximately 2-3 weeks on each unit.

Every unit includes an activity designed to integrate the topic of that unit into the eight major themes of the AP Biology Course Description. Throughout each unit discussion relates to and fits within each theme and how these themes transcend all of the unit topics.

Theme 1 – Science as a Process - This book is our beginning discussion to bring students into the mindset that science is a process in ways ranging from molecular to societal. This book allows for discussion of science topics such as use of research, consequences of technology, dangers of chemicals, use of broad span pesticides, political issues and science, and more.

Theme 2 – Evolution – Students compare ecological time with evolutionary time and examine how they correspond. Students are required to read the selfish gene by Richard Dawkins. The book brings evolution and current environmental issues into a new light and ties it to today and our current society.

Theme 3 – Energy – Students are asked to describe the movement, conversion, and storage of energy within an ecosystem from the sun to heterotrophs and beyond as dissipated heat. Students are asked to look at current bio-fuel energy sources and their viability.

Theme 4 – Continuity and change – Students are asked to consider how changes in an ecosystem affect the organisms within those ecosystems. Students research the effects of one specific organism being either introduced or eliminated from an ecosystem.

Theme 5 – Relationship of Structure and Function – Students consider how organisms are physically adapted to survive and reproduce in their environments. The human heart and plant reproductive structures are just two topics used to show the inseparable relationship between structure and function.

Theme 6 – Regulation – Students are to understand how an organism's regulatory mechanisms (such as control of body temperature) serve to aid or hinder survival in particular environments. Students are required to choose a disorder/disease that results from a failure of the system to effectively regulate a body function.

Theme 7 – Interdependence of Nature – The very basics of survival is the interaction between an organism and its environment. Students look at the chain of survival based on the interdependence of nature using local food chains and food webs.

Theme 8 – Science, Technology, and Society – Students are asked to consider how the population growth of human beings has influenced local ecosystems throughout history, and how it continues to do so, even to the extent of affecting the entire biosphere. Students are required to write a position paper on medical ethics and technology, bioengineering in food production, genetic engineering in medicine, and other related topics.

TIME	UNIT	TOPICS	CHAPTER READINGS
FIRST SEMESTER, FIRST TERM			
3 Weeks	1	Ecology AP 12 Lab - Dissolved O ₂ & Aquatic Primary Productivity (hands on) AP 11 Lab – Animal Behavior (hands on)	50, 51, 52, 53, 54, 55
4 Weeks	2	Atoms, Molecules, Bonds, Water, and Macromolecules AP 2 Lab – Enzyme Catalysis (hands on) Activity - LD 50 – What is a lethal dose of caffeine?	2, 3, 4, 5, 6
2 Weeks	3	Cells and Cell Functions AP 1 Lab - Diffusion and Osmosis (hands on)	7, 8, 11
SECOND TERM			
4 Weeks	4	DNA, RNA, Protein Synthesis, Molecular Genetics AP 6 Lab – Molecular Biology (virtual) AP 7 Lab – Genetics of Organisms (hands-on) Lab – Virtual DNA Electrophoresis Lab http://learn.genetics.utah.edu/units/biotech/gel/ Lab - DNA Extraction from Onion Cells (55 minutes, hands on)	16, 17, 18, 19, 20
3 Weeks	5	Cell Respiration and Photosynthesis AP 5 Lab Cell Respiration (hands on)	9, 10
2 Weeks	6	Mitosis, Meiosis, Cell Cycle, Classical Genetics AP 3 Lab – Mitosis and Meiosis (hands on)	12, 13, 14, 15, 19
SECOND SEMESTER, THIRD TERM			
3 Weeks	7	Evolution AP 8 Lab – Population Genetics (hands on) Book Critique of <u>the selfish gene</u>	22, 23, 24, 25
3 Weeks	8	Survey of Animals/Protists and Classification Concepts Lab - Examining Protists (hands on)	21, 27, 28, 32, 33, 34, 47
3	9	Plants AP 9 Lab – Transpiration (hands on) AP 4 Lab – Plant Pigments and Photosynthesis (hands on)	29, 30, 35, 36, 37, 38, 39
FOURTH TERM			
4 Weeks	10	Digestion, Circulation, Gas Exchange, Homeostasis, Immune System Lab – Physiology of Circulatory System (hands on) Virtual Cat Dissection (CD)	40, 41, 42, 43, 44, 45
4	11	Hormones and Reproduction, Nerves, Muscles, Sense Organs Student - Disease/Disorder Presentation	46, 47, 48, 49
1		REVIEW	

TEACHING STRATEGIES

Class time is filled with lecturing, labs and activities described in this syllabus. I expect students to spend time each night, or more hours during the weekend reading and taking notes on the textbook according to their syllabus.

I constantly use the unifying themes to connect the components of biology. I use my personal experience from working in medicine and resource management to show the theme of unity and interdependence in nature to illustrate to students the important environmental, medical, and social concerns associated with biology.

I incorporate videos with worksheets when possible. One video series that I use is the Cycles of Life. The video titled *Exploring Biology Respiration* does a great job of comparing different organisms and showing the interrelatedness of respiratory systems among different species. I also use videos and virtual labs from the Howard Hughes Medical Institute. *Of Hearts and Hypertension, Blazing Genetic Trails* ties genetic and molecular approaches to understanding cardiovascular diseases and shows the link between mutations and genes that regulate the retention of salt in the kidney.

LAB COMPONENT

Working in pairs, students usually do every lab exercise in the AP Biology Lab Manual for Students. They also do a variety of labs I have used in other courses I have taught throughout the years such as DNA extraction from an onion cell. The time for each AP Manual lab is stated in the AP Biology Lab Manual and those labs do take the number of periods stated.

Students are required to turn in a lab write-up for each lab completed, or I check for completion in labs that require model building. For labs taken from the AP Lab Manual students are required to complete the graphs and answer the questions in the manual. Students have two days from the completion of the lab to turn in their reports.

I always emphasize understanding of the process for all activities and labs. To check for understanding a quiz is given after each lab or activity that reflects concepts covered. If students failed to comprehend the purpose of the lab/activity the topic is revisited and another quiz is taken.

STUDENT EVALUATION

I use unit test, chapter quizzes, lab reports, lab quizzes, topic worksheets, biological current events, and research papers to evaluate my students' learning. Students are encouraged to ask questions and participate in class discussion which helps evaluate student learning.