

May 2018

Most Awesome and Concerned Parents,

Welcome to a new school year!! This is my fourteenth year at Kalaheo and my seventh year teaching AP Biology, which I am extremely excited about. This course is challenging, but very rewarding. During this class, we will merge Biology with Chemistry to develop a deep and enduring understanding of life on Earth. It is a very exciting learning adventure!!

AP Biology is equivalent to two semesters of a college Biology course for majors, including the lab portion. The class will be conducted at the college level and students are expected to work accordingly. In addition to regular classes, the students may need to come in after school to complete some of the labs & study sessions. These labs take longer than a 75-minute period. The class will choose the dates and times for these activities together. **All students are expected to attend these dates.** Welcome to one of the toughest, but coolest and most interesting classes on campus!

My teaching philosophy is that all students can learn, and all students learn differently, as described in Howard Gardner's work on multiple intelligences. Most students learn science best by doing labs and by seeing how the information they are learning applies to their everyday lives, giving the course greater relevance.

For these reasons, I have implemented the "flipped teaching model" in my AP Biology class. Lectures & notes are posted on my wiki, students watch the lectures at home for homework, allowing them to absorb the lecture at their own pace, pausing and rewinding the video as each student deems necessary. In addition, students complete guided reading notes at home using their textbook. This frees up more face to face instructional time for hands on labs, demonstrations, and one on one interactions between the teacher and the student and collaborations between students. Students are motivated to take more responsibility for their learning, and my role is more that of a coach, allowing instruction to be more student focused, rather than teacher directed. This flipped teaching model has allowed my students and I to **spend at least 30% of class time on labs and hands on science investigations. (Curricular Requirement 6)** and discussions about current events in science (taken from science journals such as *Science* and *Nature*, popular science magazines such as *HHMI* and *Scientific American*, newspaper articles, public television, and case studies, are incorporated into the course allowing my students **the opportunity throughout the course to make connections with the applications of modern biology to today's environmental, ethical, health, and social problems (Curricular Requirement 4)**

To assist students with the high expectations in the course, my course wiki includes study tips, lab report writing formats and tips, links to the video lecture notes, homework assignments, and links to many resources on the web that help reinforce student learning. Pregitzersninjascienceclasses.wikispaces.com

Exams will always mimic the National AP Exam with multiple choice questions, short answer questions (3-5 sentences), and one major essay. There will also be three projects, one during each break. Students will also be graded on quizzes, lab reports or poster presentations of lab work and homework. **(Curricular Requirement 8)**

Students are expected to maintain a C or better in the class. If they are not working to this level, I will conference with your student to decide on a plan. If you notice that your student is having trouble or you are concerned, please let me know right away. The more I know, the more I can help!! Grades will be posted on jupitergrades.com as frequently as possible. Late work will be posted at a later date (please do not expect it to be posted immediately).

The AP Biology exam is in May and is the culminating experience of the class. This nationally sponsored exam gives students the opportunity to earn college credit for their hard work. More importantly, the exam is an experience that prepares students for the rigor of college! **Every student is expected to take the Exam in May.** AP Biology is a very intense course until the exam in May. After the exam, the students will work on a special fun project together!

I'm looking forward to the fun-filled, learning-intense year ahead of us. Please feel free to call (305-0237) or email me through JupiterGrads at mpregitzer@kalaheohigh.k12.hi.us

Biology is a fascinating and relevant topic!! I really love teaching it!! I hope to meet you at the Open House in August.

Aloha,
Micah pregitzer

Advanced Placement Biology Course Outline

Throughout the year we will be exploring the following 4 Big Ideas and their Enduring Understandings in Biology. We will continually search for new ways to utilize these themes to establish connections between topics. **(Curricular Requirement 2)**

Big Idea 1: The process of evolution drives the diversity and unity of life (approximately eight weeks)

Enduring understanding 1.A: Change in the genetic makeup of a population over time is evolution.

Enduring understanding 1.B: Organisms are linked by lines of descent from common ancestry.

Enduring understanding 1.C: Life continues to evolve within a changing environment.

Enduring understanding 1.D: The origin of living systems is explained by natural processes.

Chapters in Campbell's Biology 10th edition to support the above Enduring Understandings:

4.1 - Organic Chemistry is the Study of Carbon Compounds

22 - Descent with Modification: A Darwinian View of Life

23 - The Evolution of Populations

24 - The Origin of Species

25 - The History of Life on Earth

26 - Phylogeny and the Tree of Life

Hands on Labs and Activities used to support the above Enduring Understandings:

Artificial Selection Using FastPlants

BLAST Lab Using DNA Subway Bioinformatics Tool

Breeding Bunnies Lab from PBS Evolution website

Coacervate Lab

Evolution Time Line

PCR Lab Analysis of Alu at PV92 Locus

Transitioned Hardy Weinberg Lab

Using Restriction Maps to Generate Cladograms

Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis (approximately nine weeks)

Enduring understanding 2.A: Growth, reproduction and maintenance of the organization of living systems require free energy and matter.

Enduring understanding 2.B: Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments.

Enduring understanding 2.C: Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.

Enduring understanding 2.D: Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment.

Enduring understanding 2.E: Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.

Chapters in Campbell's Biology 10th edition to support the above Enduring Understandings:

3 - Water and Life

4 - Carbon and the Molecular Diversity of Life

6 - A Tour of the Cell

7 - Membrane Structure and Function

8 - Introduction to Metabolism

9 - Cellular Respiration and Fermentation

10 - Photosynthesis

38 - Angiosperm Reproduction

39 - Plant Responses to Internal and External Signals

40 - Basic Principles of Animal Form and Function

43 - The Immune System

51 - Animal Behavior

52 - Introduction to Ecology and the Biosphere

54 - Community Ecology

Hands on Labs and Activities used to support the above Enduring Understandings:

Diffusion and Osmosis

Effects of Different Environmental Conditions on Earthworm Behavior

Factors that Influence Rates of a Potato Catalase Catalyzed Reaction

Modeling Surface Area to Volume Ratios Using Potatoes and Iodine

Photosynthesis

Toothpickase

Transitioned Cellular Respiration Lab

Big Idea 3: Living systems store, retrieve, transmit and respond to information essential to life processes (approximately nine weeks)

Enduring understanding 3.A: Heritable information provides for continuity of life.

Enduring understanding 3.B: Expression of genetic information involves cellular and molecular mechanisms.

Enduring understanding 3.C: The processing of genetic information is imperfect and is a source of genetic variation.

Enduring understanding 3.D: Cells communicate by generating, transmitting and receiving chemical signals.

Enduring understanding 3.E: Transmission of information results in changes within and between biological systems.

Chapters in Campbell's Biology 10th edition to support the above Enduring Understandings:

11 - Cell Communication

12 - The Cell Cycle

13 - Meiosis and Sexual Life Cycles

14 - Mendel and the Gene Idea

15 - The Chromosomal Basis of Inheritance

16 - The Molecular Basis of Inheritance

17 - Gene Expression: From Gene to Protein

18 - Regulation of Gene Expression

20 - DNA Tools and Biotechnology

48 - Neurons, Synapses, and Signaling

51 - Animal Behavior

Hands on Labs and Activities used to support the above Enduring Understandings:

Mutant Hunt

Mitosis and Meiosis Lab

Restriction Analysis of DNA

pGLO Bacterial Transformation

PCR Analysis of Alu at PV92 Locus

Modeling DNA Replication Using Velcro

Selected Activities from NIH Curriculum Unit "Cancer and the Cell Cycle"

Modeling Lab and Trp Operons Using Poster Tubes and Pool Noodles

"Pom Pom" Potential Model of Action Potentials from Genetics Science Learning Center

Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties (approximately eight weeks)

Enduring understanding 4.A: Interactions within biological systems lead to complex properties.

Enduring understanding 4.B: Competition and cooperation are important aspects of biological systems.

Enduring understanding 4.C: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Chapters in Campbell's Biology 10th edition to support the above Enduring Understandings:

5 - Structure and Function of Large Biological Molecules

6 - Tour of the Cell

- 8 - Introduction to Metabolism
- 23 - Evolution of Populations
- 40 - Basic Principles of Animal Form and Function
- 52 - Introduction to Ecology and the Biosphere
- 53 - Population Ecology
- 54 - Community Ecology

Hands on Labs and Activities used to support the above Enduring Understandings:

- Clay Models of Embryonic Development
- Pom Pom Potential Activity
- Dissolved Oxygen Lab
- Fruit Fly Behavior Lab
- Survey of a Local Ecosystem and its Diversity Index

Text Used:

Reece et. al. AP Edition Campbell *Biology*, 10th Edition. Pearson, 2014. **(Curricular Requirement 1)**

AP Biology Investigative Labs: An Inquiry-Based Approach

Examples of Connections Between Big Ideas and Enduring Understandings (Curricular Requirement 3)

Big Idea 1, the process of evolution drives the diversity and unity of life, and Enduring Understanding 4.B, competition and cooperation are important aspects of biological systems, are connected in the "Teddy Grahams and Evolution" activity. Students simulate a population undergoing selective pressure and predators are competing for prey, and observe how the selective pressure and competition affect the change in phenotypic frequencies in the population.

Big Idea 2, biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis, and Enduring Understanding 4.A, interactions within biological systems lead to complex properties, are connected when students use magnetic water molecules to examine the properties of water, and discuss how the hydrogen bonding of water molecules leads to important and complex biological properties, such as cohesion and adhesion of water leading to capillary action, or the cooling effects when sweat evaporates from the skin.

Big Idea 3, living systems store, retrieve, transmit and respond to information essential to life processes, and Enduring Understanding 2.D, growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment, are connected when students study animal behavior. In the earthworm lab, students design an experiment to test how different variables affect the location of earthworms over a one week period of time, showing how organisms respond to information they sense in their environment.

Big Idea 4, biological systems interact, and these systems and their interactions possess complex properties, and Enduring Understanding 3.D, cells communicate by generating, transmitting and receiving chemical signals are connected through the Pom-Pom potential activity, where students model the movement of ions across neuronal membranes and the generation of action potentials. This activity is preceded by a pair-share discussion of neurotransmitters and their function in opening ion channels in nervous system transmission.

Science Practices outside of Laboratory Experiences (Curricular Requirement 5)

5a: One example of how students apply representations and models is by constructing models of the lac and trp operons from poster tubes, pool noodles and colored tape. Students then use these models to explain the mechanisms that control the expression of the genes coded for by those operons.

5b: In the Chi-Square and M & Ms activity, students apply mathematical processes (Chi-square calculations) to determine if the observed color frequencies of M & Ms is significantly different from the expected color frequencies.

5c: Students engage in scientific questioning when discussing scientific literature, such as in a discussion about recent research on telomeres, and how lifestyle factors such as diet and exercise may reduce the rate of degradation of telomeres. Students then ask questions and hypothesize as to why lifestyle factors may have such an effect, and what other factors may affect telomere length.

5d: While conducting a multiple-visit survey of a local salt marsh ecosystem, students plan and implement data collection strategies to answer their questions about the ecosystem.

5e: Using an National Institutes of Health simulation of how vaccination rates affect "herd immunity," students perform data analysis and evaluate evidence supporting the importance of vaccinations.

5f: During the analysis and post video discussion of the PBS Evolution video "Evolutionary Arms Race," students apply Darwin's theory of natural selection to explain why antibiotic resistant bacteria are constantly evolving.

5g: Students construct a 6 meter long evolutionary time line, on which they indicate and illustrate major biological and geologic events in Earth's history, allowing to them to relate knowledge across various scales, concepts and representations.

Student-directed Lab Investigations and Science Practices(Curricular Requirement 7)The matrix below describes which science practices are emphasized in each of the student directed investigations.

Lab	Science Practice 1: The student can use representations & Models to communicate scientific phenomena and solve scientific problems	Science Practice 2: The student can use mathematics appropriately	Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.	Science Practice 4: The student can plan and implement data collection strategies appropriate to a particular scientific question.	Science Practice 5: The student can perform data analysis and evaluation of evidence.	Science Practice 6: The student can work with scientific explanations and theories.	Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts and representations in and across domains.
Hardy Weinberg Lab	X	X			X	X	X
Breeding bunnies Lab	X	X		X	X	X	X
Blast Lab	X	X	X	X	X	X	X
Artificial Selection Using Fast Plants		X	X	X	X	X	X
Cellular Respiration Lab		X	X	X	X	X	X
Photosynthesis Lab		X	X	X	X	X	
Diffusion Osmosis Lab	X	X		X	X	X	
Surface Area to Volume Ratios	X	X			X		
Mutant Hunt			X	X	X	X	

Mitosis & Meiosis		X	X	X	X	X	X
Biotechnology		X	X	X	X	X	X
Dissolved Oxygen		X	X	X	X	X	X
Animal Behavior			X	X	X	X	X
Survey of a local Ecosystem	X	X	X	X	X	X	X

Please sign and return to Mr. Pregitzer by Tuesday, August 8th, 2017

PLEASE READ AND SIGN ALL OF THE SECTIONS BELOW

I have read and understand the AP Biology course syllabus.

Printed Name of Student

* _____
Student Signature

Date

* _____
Parent or Guardian Signature

Date

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I have read and understand all of the lab safety guidelines detailed in the Kalaheo Laboratory Safety Guidelines contract.

Printed Name of Student

* _____
Student Signature

Date

* _____
Parent or Guardian Signature

Date

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We may periodically watch curriculum related movies that are PG or PG-13 rated (for example The Andromeda Strain). Check one of the following and sign.

_____ My child has permission to view PG and/or PG-13 movies in class.

_____ My child DOES NOT have permission to view PG and/or PG-13 movies in class.

* _____
Parent or Guardian Signature